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Bob Evans

(p. 108)

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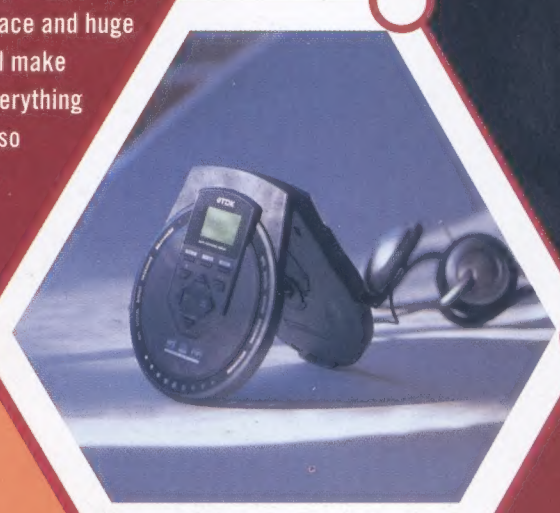


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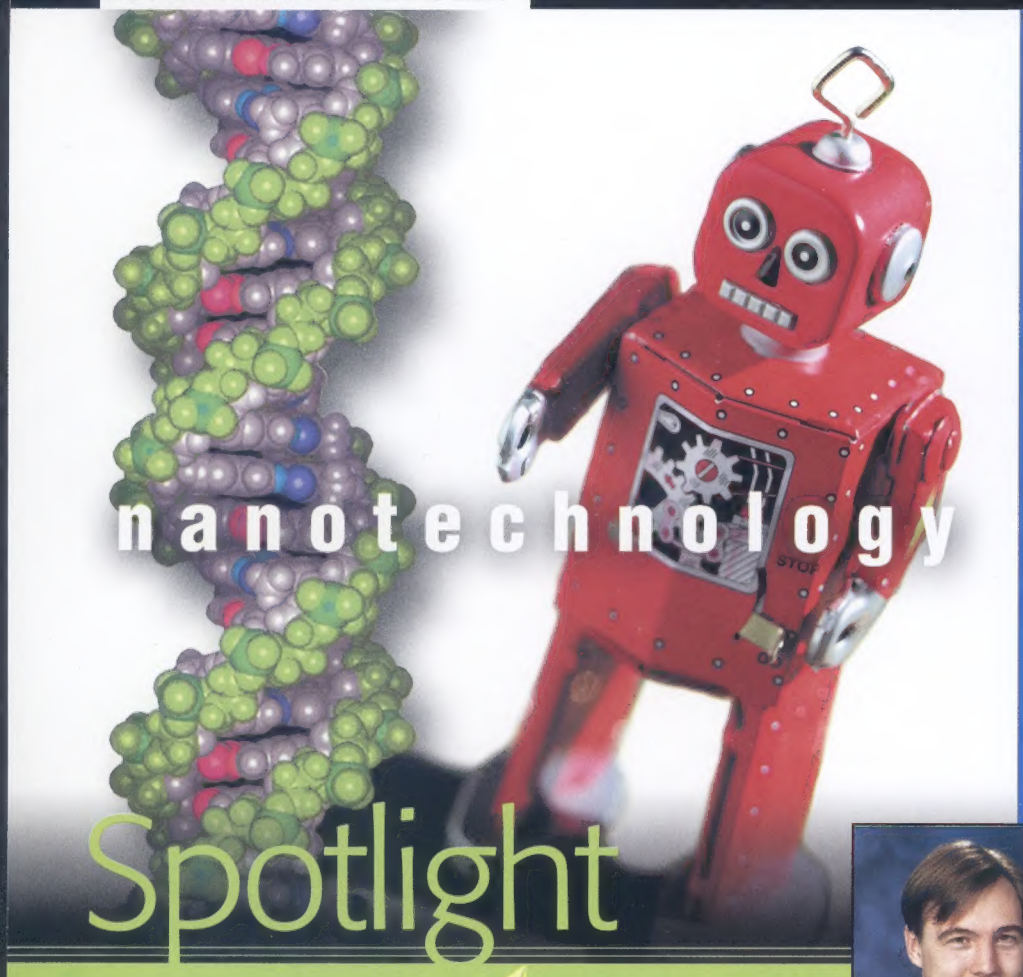

Spotlight

Frontside

The Experts

Did you find the hidden CPU logo on our cover?
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Heavy Gear

Hard Hat Area

Loading Zone

Caught In The Web

Digital Living

Tips & Tricks

What's Cooking

Back Door

Infinite Loops

Strange stats and other oddball items from computing's periphery

Greetings From Samitland

Broadband. Wireless. Always connected. (::*sigh*::) Perhaps on the good days. Zoiks, hello—sorry, I didn't see you sitting there. Welcome to *Computer Power User*. It's nice to have you back. For those keeping track, we're at issue four already and still powering on, thanks to you.

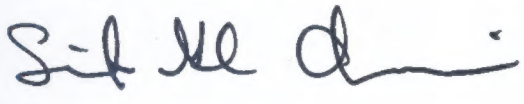
This month's Spotlight articles focus on nanotechnology. Some might think this topic is a bit sci-fi, but the technology is progressing quite well. Here's one of the many examples you'll read about in this section: Some scientists predict that in 10 years we'll have microprocessors in our door knobs to provide security instead of keys and locks. Interested? Join us and find out more. And be sure to let us know what you think. We're discovering that you are not the type to hold your opinions back. And I have to be honest, that's something I like very much. Good or bad, let us know what you think.

When you caught me above earlier, I was bemoaning my unconnected state. Back home in the States, I'm connected 24/7: cable modem at home, Palm VII on the go, and the glorious T3s at the office. Heck, I just bought a Garmin eTrex Vista GPS for my fiancée so we'll always know where we are. But right now, I'm quite distant from the technology we all know and love so much.

I'm writing from Kolkata (formerly known as Calcutta), India, but I've come to think of it as connection hell. I've been looking for a local dial-in for a week now; neither AT&T nor Sprint have been able to help me with a direct access number because I have to pulse dial. Internet cafes are not convenient for staying connected with my co-workers, and the connections (when I manage to get them) are terrible. My idea of staying connected with the office using remote access dial-in was just a well-intentioned fantasy that has long since gone awry.

That's not to say I can't make a connection anywhere in India. That would be doing other connected Indian cities, such as Bangalore, Delhi, and Mumbai, a disservice. My experience here is just a stark reminder that the oft-touted ideal of the globally connected world that telecom companies love to show in ads is a long way off. And this technology is nowhere near the common man. At least not the way we see back home in the United States. Now if you'll excuse me, I've got two hours of dialing to do before I get a connection good enough to send this column back to the office. Boy, I can't wait to plug into my cable modem back in good ol' Lincoln, Nebr.

But hey, I've got a roof over my head, a bed to sleep in, and my health. So life is better than it sounds. Be well. I look forward to seeing you next month when I'm plugged in again.



Samit G. Choudhuri, Publication Editor, *CPU*

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Customer Service
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Editorial Staff
editor@cpumag.com
FAX: (402) 479-2104
131 W. Grand Drive
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Advertising Staff
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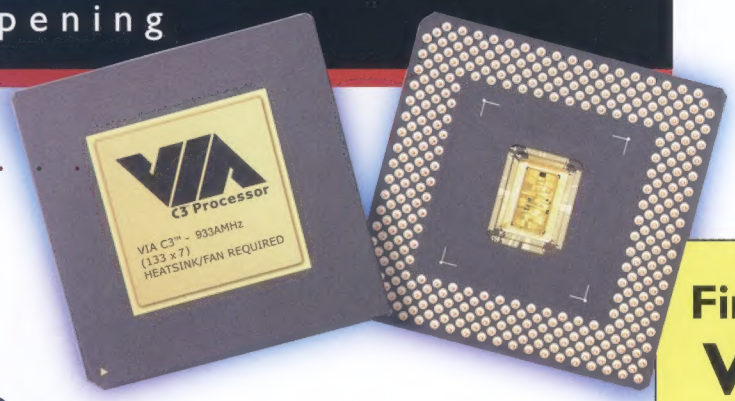

VIA Debuts Cool 933MHz Processor

Currently in production, VIA's new C3 processor handles clock speeds up to 933MHz without breaking a sweat. VIA bills the C3 as the coolest-running x86 processor available and claims the C3 doesn't even require a fan. Based on an earlier processor code-named Samuel, the current C3 is the first processor ever to be built on a 0.13-micron core.

Complete with 128KB Level 1 cache and 64KB Level 2 cache, 100/133MHz FSB, 3DNow! and MMX instructions for steroidal multimedia, and Socket 370 compatibility, the tiny C3 packs a huge punch. VIA hasn't given word about when the C3 will hit the streets, but it shouldn't take long for the processor to start powering notebooks. At press time, VIA representatives hadn't replied to our requests for additional information about availability and pricing. ▲

TI Makes New Bedfellows

Texas Instruments recently licensed HyperTransport, AMD's computer chip bus technology, with no fanfare and little comment. Also adopted by NVIDIA for its nForce platform processing architecture, HyperTransport provides interconnectivity with AGP and AGP 8x; 1Gb and 10Gb Ethernet; FireWire; Infiniband; and PCI, PCI-X, and PCI 3.0.

TI will likely incorporate HyperTransport technology into its DSP (digital signal processor) chips, but for now, the company's comments remain vague. According to Steve Schnier, Market Segment Manager for PC Connectivity Solutions at TI, "HyperTransport is an important enabling technology that will allow TI to create devices that promote innovation and new applications in computers, telecom, and various other equipment."

In other news, Palm recently chose TI to supply chips for its next-generation wireless devices. According to TI spokesperson Matt McKinney, wireless Palm devices using TI's OMAP (Open Multimedia Applications Protocol) processor platform should surface by the end of 2002.

"TI's strategy with the OMAP processor platform has been to support a scalable platform across wireless voice, data, and multimedia, regardless of the form factor," says McKinney. OMAP "has become the processing platform of choice for 2.5G and 3G wireless handsets, PDAs, and mobile Internet devices today." With powerhouses such as LG Electronics, Nokia, and Sony also on the OMAP bandwagon, consumers will surely see a number of innovative wireless products in the coming months. ▲

Texas Instruments worldwide headquarters is located on Forest Lane in Dallas, Texas.
Photo Courtesy of Texas Instruments

FireWire Goes Wireless

Apple's FireWire (as IEEE 1394 is better known) recently went wireless and simultaneously got faster. Wireless FireWire is the result of a joint effort between Apple and IEEE's Task Group E, which oversees development of the 802.11e specification for wireless LANs.

802.11e, which bridges the gap between commercial and consumer wireless to provide a universal standard that is backward compatible with 802.11a and 802.11b, made wireless FireWire possible. Wireless FireWire devices will now be able to enter the 5GHz frequency and the realm of 54Mbps data transfer rates.

The most interesting Apple news, however, remains cloaked in mystery. Apple is apparently developing a technology it trademarked under the name GigaWire, but this may simply be a moniker for the newly unleashed wireless FireWire. Apple isn't talking about GigaWire, but according to the trademark application, the technology will be used in "computers, telecommunications equipment and devices, or computer peripheral devices." ▲

FireWire

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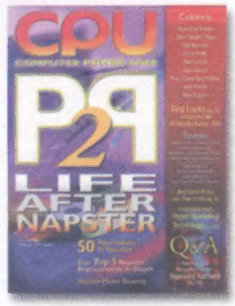

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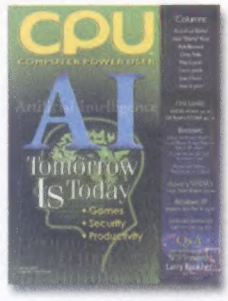

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Red-M Paves The Way For Secure Commercial Wireless

Red-M (www.red-m.com), a company based in the United Kingdom known for making components for PDAs and WAP devices, recently unveiled a significant advancement in IEEE 802.11 WLAN and Bluetooth integration. Red-M began developing the new architecture, dubbed Genos, almost three years ago. The result is a "wirelessware" product suite that endows Bluetooth-based devices with the benefits of 802.11 security.

"Red-M coined the term 'wirelessware' to describe suites of software products that operate in wireless space," says Red-M spokesperson Rob Forbes. "So you have software, netware, middleware, and wirelessware." Red-M also provides an API that permits third-party development; using the API's three primary functions (get, set, and post), developers can create highly manageable networks.

Genos works with 802.11b, as well as high-speed 802.11a and 802.11g and appears to be quite scalable. Its potential extends beyond traditional configurations to include cellular networks. Genos offers multiple security levels that will undoubtedly alleviate network administrator headaches, including link-level authentication, link-level encryption, device-specific authorization, per-service access control, and individual username/password authentication. "Red-M's Genos wirelessware is currently shipping," says Forbes. "We expect to see a gradual take-up of Genos wirelessware from Q1 2002" in North America. ▲

1GHz Mobile AMD Duron Heads To Retail

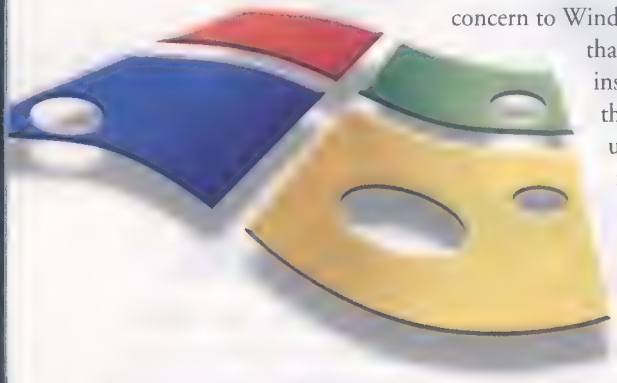
The new Windows XP-friendly 1GHz mobile AMD Duron processor started showing up around the holidays in Compaq's Presario notebooks, and AMD says the processor will be available for retail sale this spring. Based on the Morgan core and built using 0.18-micron technology, the 1GHz mobile AMD Duron enables low-power operation (2 watts average for notebooks running typical office applications) for extended battery life without compromising processing power (an ability AMD calls PowerNow!). At press time, the 1GHz mobile AMD Duron listed for $160, compared to $290 for the 1GHz mobile AMD Athlon 4. Pricing is less than that for Intel's comparable 900MHz Mobile Pentium III, which has a $275 estimated street price. ALi and VIA are shipping UMA chipsets that support both of these processors. ▲


The new mobile AMD Duron processor has 25 million transistors on a die size of 105.7mm².

In Software . . .

Microsoft Releases XP Patches & Enhancements

Those who predicted Windows XP would be riddled with security holes received a taste of vindication when Microsoft released Security Bulletin MS01-059. The bulletin describes a patch that is mission critical for XP users and of "moderate" concern to Windows 98/98SE/Me users that have UPnP service installed and running. In these OSes, UPnP has an unchecked buffer that permits buffer overruns and leaves systems open to crackers, who can access vulnerable machines and run any code they want. The FBI initially warned XP users that Microsoft's fix was insufficient and suggested disabling UPnP altogether; the FBI has since reversed that advice.



Microsoft also recently released a free enhancement package that adds support for dozens of software applications. The package is available as a free download via Windows Update. Another free goody for XP is the Windows Media Bonus Pack, which includes an MP3-to-WMA audio file converter, audio clips for adding sound effects to home videos using Movie Maker, and a bucketload of skins and visualizations for Windows Media Player. At press time, Microsoft hasn't added USB 2.0 support to XP, but it seems likely that by the time you read this, a patch will be available. Bluetooth support is also on the horizon for summer 2002. ▲

Digital Watermarking Reaches New Depths

Digital watermarking typically describes injecting an audio or video file with metadata, or information about the file, such as the file's author, content description, and copyright information. Digital watermarks, which have evolved to include data that prevents file copying without degradation of content, can now leave an e-version of a paper trail, thanks to Amino Communications (www.aminocom.com).

The company is developing a watermarking chip and software for use in digital video recording devices. (Think TiVo.) The chip and software gather device information (the type of information depends on the device) and embed it in the copied file (whether it's on a videotape or DVD-R) so that authorities can trace the file back to a particular device or even a specific user.

"It is up to the system (for example, an STB [set-top box] or media server) to decide what goes into the watermark," says Martin Neville-Smith, director of technology for Amino. "The information could be a user's unique ID gathered from the chip on the smart card inserted into the STB, [or] if there isn't a smart card, it could be the serial number on the set-top box."

The technique can employ different wavebands for different watermarks. "Hence a studio can embed its mark in one band, the distribution channel in a second, and the STB itself can use a third band," says Neville-Smith. "Alternately, different bands can be used for the same information, thus making that information doubly secure." For security, the technique "uses a secure key as a seed to generate a long pseudo-random sequence, and the numbers, up to 1,024 bits in length, are then used for generating the actual watermark." The process also adds a checksum to the number to ensure correct interpretation.

At least one Hollywood film distributor has expressed interest in this technology, but at press time, Amino was unable to name names. ▲

Intel Shares Its Computer Vision Wealth

Intel recently announced that its OpenCV (Open Source Computer Vision) library of more than 500 functions will be available via free download to academic and industry researchers. This is a rare move in the field and an especially giving moment for Intel. Researchers who use MATLAB, for example, to integrate vision and mathematical computing, can now import functions from the OpenCV 2.1 toolkit.

Through Intel's OpenCV lab, the semiconductor giant has developed CV apps roughly along the same lines as voice recognition. CV applications, which lets computers "see" in three dimensions, are already used in various industries, such as factory-line integration for visually catching potential product flaws before products roll out the door. The technology is also used for HCI (Human-Computer Interaction), object identification, face and gesture recognition, video security apps, and toys.

"We saw an opportunity to accelerate innovation in that . . . very fragmented field" of CV, says Intel Labs spokesperson Kevin Teixeira. Intel realizes that "five to six years from now we're going to have even more powerful microprocessors, and we can see trends where computer vision capabilities could be incorporated into a lot of different products." Notebooks with integrated CV, for example, could provide user security.

And, according to Teixeira, "when we talk about home networks, it won't just be to the printer. There will be other intelligent devices sharing that network, whether it's your home theater or the heating and cooling system of your house." The development community has provided an overwhelmingly positive response to the OpenCV library; OpenCV now has more than 2,000 user group members. ▲

RealOne Eclipsed By Microsoft's Corona

Right after RealNetworks announced its RealOne media player, Microsoft made its own announcement: A new Windows Media technology, code-named Corona, was on its way for 2002. Now in beta, Windows Media Services in Windows .NET Server offers the first real taste of Microsoft's new audio/video streaming experience.

Microsoft's FastStream technology provides broadband users with "instant-on, always-on," buffer-free streaming. WMV (Windows Media Video) codec enhancements include a 20% efficiency boost compared to the current codec, "HDTV-like" video quality, and 5.1-channel Dolby surround sound. The "instant-on" streaming bit isn't new, but the overall Windows Media Technologies package and an improved SDK ensure widespread integration. ▲

Gamy Selections

Lest we forget that the United States is not the center of the computer game universe, here are a couple recent, noteworthy items from the U.K. gaming wire.

The Great Gaming Convergence

Get your passports ready, boys and girls, and book a plane or boat to the U.K., where Barbican (www.barbican.org.uk) will hold the ultimate gaming history convention from May 16 to Sept. 15, 2002. Game On, as it's called, will feature over 250 exhibits in Barbican's quest to cover (from 1962 to 2002) of computer gaming. If you miss Pong, Space Invaders, and Donkey Kong, you'll find them at Game On; top developers of games such as Tomb Raider and Grand Theft Auto will also be on hand to discuss their creations.

Creatures Are Coming

German developer/marketer Swing! Entertainment (www.planetswing.de) recently released Nintendo GameBoy Advance and PlayStation One versions of the popular game Creatures in the U.K. An American release should follow soon; at press time, both Nintendo and PlayStation listed the game as a future release. Swing! touts Creatures as an artificial intelligence simulation game centered around adorable little critters called Norns. Players guide the Norns away from dangerous flora and fauna, and the Norns pick up new skills along the way.

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Internet Bits

Here are a few Internet news items we found right before press time.

Yahoo! Buys HotJobs

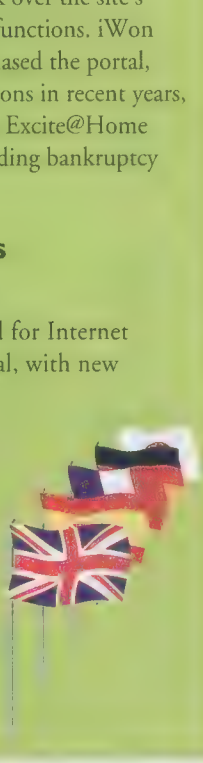
Although HotJobs (www.hotjobs.com) had agreed to a merger deal with TMP Worldwide (which owns Monster.com), the company paid $17 million to TMP to terminate the merger after accepting a $436 million bid from Yahoo! to purchase HotJobs outright.

Excite@Home Says Goodbye

As Excite@Home prepared to cease operations in late February, iWon took over operations of the Excite.com portal while Info-Space took over the site's search and directory functions. iWon and Info-Space purchased the portal, which was worth billions in recent years, for $10 million when Excite@Home announced its impending bankruptcy late last year.

MP3.com Goes International

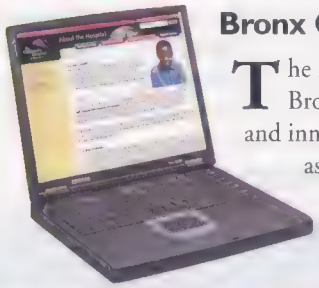
The leading portal for Internet music has gone global, with new sites for the **United Kingdom** (www.uk.mp3.com), **Spain** (www.es.mp3.com), **France** (www.fr.mp3.com), **Germany** (www.de.mp3.com), and **Japan** (japan.mp3.com).



Internet . . .

New On The 'Net

Looking for some new surfing destinations? Here's a sampling of the many sites that recently hit the Web.



Bronx Children's Hospital Gives Kids Web Access

The Montefiore Medical Center's new Children's Hospital, serving the Bronx region of New York City, provides care using the most advanced and innovative medical technologies. But the hospital does something else as well: Thanks to the Carl Sagan Discovery Program, each bed is equipped with a wireless computer that lets patients surf education-related Web sites and communicate with family and friends via the center's intranet. ▲

NVIDIA Settles After Alleged Break-In

Graphics chip manufacturer NVIDIA settled a case in which two alleged crackers from the Netherlands accessed confidential product information and apparently diverted it to the M3DZone Web site (www.m3dzone.com). The alleged crackers penetrated NVIDIA's firewall and used e-mail to masquerade as legitimate NVIDIA employees to gain information. NVIDIA took notice when it saw confidential information posted on the M3DZone site. Says M3DZone Director and Editor in Chief Michael Beenan, "We have taken all possible measures to not let this happen . . . again." ▲

One-Stop Music Shop

ilikemusic.com (www.ilikemusic.com) strives to be the jack-of-all-trades for music lovers and music makers alike. The site has plenty of room to grow, but with its slick design and initial offerings, it seems to have found a worthwhile groove. It offers resources for fans (including interviews, concert reviews, music news, and a chat room) and mixmasters (click Make Music, and you'll find everything you need to make, mix, and listen to music), but it also offers a wealth of up-to-date information for musicians and DJs trying to find success in a crowded industry. Click Music Careers, for example, for the latest career news and courses, studio and producer info, and even a resume template. The site is based in the United Kingdom but contains some United States information, as well. ▲

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/mar02/bios to see the entire upgrade list.

Mfr	File/Date Available	URL
ASUS	A7M266-D BIOS version 1004 (12/26/2001)	usa.asus.com/download/mbdriver/soketa.htm
ASUS	A7N266-E BIOS version 1001.A (12/27/2001)	usa.asus.com/download/mbdriver/soketa.htm
ASUS	A7N266 BIOS version 1001.A (12/27/2001)	usa.asus.com/download/mbdriver/soketa.htm
ASUS	A7N266 BIOS version 1001 (12/06/2001)	usa.asus.com/download/mbdriver/soketa.htm
ASUS	P4B266 BIOS version 1004 (12/26/2001)	usa.asus.com/download/mbdriver/mb-socket478.htm
ASUS	P4B266 BIOS version 1003 (12/12/2001)	usa.asus.com/download/mbdriver/mb-socket478.htm
ASUS	TUSI-M BIOS version 1011 (12/26/2001)	usa.asus.com/download/mbdriver/socket370.htm
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Compiled by Steve Smith

You Get Paid For That?

Gameboy Advance Programmer

Hyperspace Cowgirls

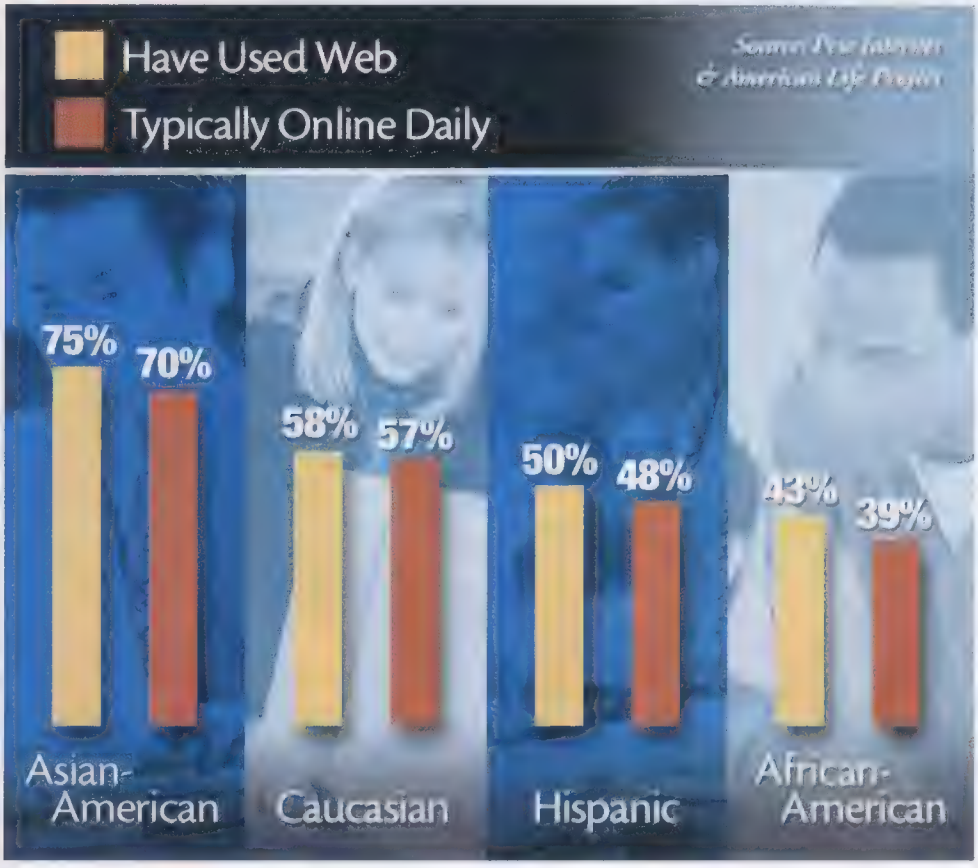
If you're a games programmer with a high tolerance for noxious teen idols, pink game boxes, and polysyllabic company names, send your resume and demo reel off to Hyperspace Cowgirls this minute. The same developer that brought us Christina Aguilera: Follow Your Dreams for the PC and Barbie Fashion Pack Games wants you to code the next generation of cute and cuddly handheld games.

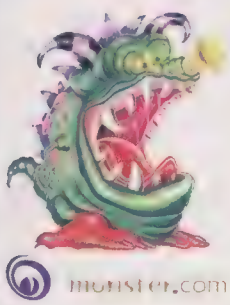
Expect to be mired in the cult of young girls (ages five to 15), however, because the job calls for you to design, code, and run QA (quality assurance) on projects, as well as brainstorm new titles along the lines of Mary Kate And Ashley's Dance Party Of The Century, another Hyperspace Cowgirls property. GBA programming experience is preferred, but the Cowgirls also plans to develop for the Web and interactive TV markets. Hey, if you can squeeze something fun out of the Mary Kate and Ashley franchise on ITV, make them give you a big, fat raise. ▲

Asian-Americans Are Kings Of The Web

By a margin about as large as the Pacific Rim, Asian-Americans are the most dedicated and youthful Web users among U.S. ethnic communities, according to the Pew Internet & American Life Project's recent survey (www.pewinternet.org). Three-quarters of Asian-Americans have used the Web and 70% log on daily, which is nearly 20 points higher than the next most dedicated group, Caucasians. Asian-American Webizens are also among the youngest ethnic groups online, with 28% between ages 18 and 24 and 63% aged 34 or younger (compared to 38% for Caucasians). The superlatives go on. Not only does this group tend to have the largest concentration of experienced Web veterans, but Asian-Americans also spend much more time online when they do log on. Now that's a dream market. ▲

Ethnicity & Web Use





Monster Mash

Who says Web surfing is a solitary experience? According to a recent Knowledge @Wharton newsletter from the Wharton School at the University of Pennsylvania (knowledge.Wharton.upenn.edu), things get pretty crowded over at mega-jobs site Monster.com, even though no one actually steps on anyone else's toes. On any given Monday afternoon between noon and 4, 6 million people log on to the site and search for a new job. We knew Mondays sucked, but who knew that they made so many of us look for a new gig? ▲

by Alex St. John

The Importance Of Violent Video Games

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

I was asked in a press interview recently if I thought the events of 9/11 should motivate the game industry to make less violent games. I found the question very perplexing. Why? Does somebody think Osama bin Laden got that way playing Quake? Do we want the soldiers we're sending over there to kill real people to be docile pacifists right up until being dropped into live combat? I didn't hear anybody say, "Hey maybe we should rethink religion; it seems to have caused an awful lot of bloodshed throughout history." No we don't hear that, but for some reason, video game violence might need to be re-examined.

When some wacked-out kid shoots up his high school, the news never fails to mention that the kid played violent games as though that might have been the cause. Meanwhile, in places where nobody plays video games, we hear about thousands of Rwandans collectively deciding to chop up their neighbors with machetes, Egyptian terrorists machine-gunning a bus load of tourists, and lunatics trying to detonate their sneakers on major airlines without a single media aid to inspire them. Where does all this creative initiative come from?

Games are a 21st century outlet for normal and healthy aggression.

The press often asks me game violence-related questions, but I know that if I say, "Yes, I think violent games are very important to growing up," all that will appear in print is, "Technology Company CEO advocates violence and corrupting children with video games." I'm going to go way out on a limb this month and express exactly why I think violent games are not only a good thing, but also necessary and important to their largest audience: 17-to-25-year-old men.

Men, especially young ones, are aggressive; this fact cannot be denied or suppressed. We have structures in place in society to teach young men how to appropriately channel and manage their aggressive tendencies. High school football, wrestling, and other sports are all games of simulated combat. They provide a framework for young males to behave "violently" in a socially appropriate, even celebrated context. Notice, however, that the word "violent" is not used frequently to refer to popular sports; the socially accepted term in this context is "competition." Interestingly, two of the most popular PC games in history, Deer Hunter and DOOM, are about another primal male behavior: hunting.

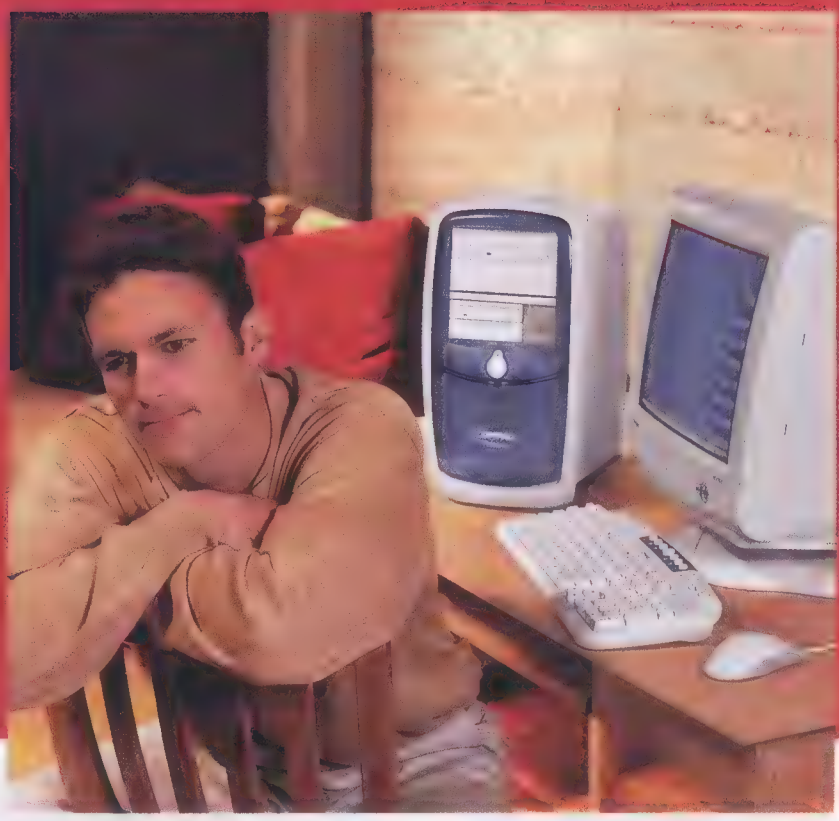
The advent of new mediums has always been traumatic for societies to accept. When it became possible to publish books widely, there was immediate demand for "violent stories." The news, our daily source of "information," is often little more than "violence" coverage. The same is true for movies and television. These mediums did not create the demand for violent content; it has always been there. Games are no different, nothing new, nothing more dangerous than any medium that has gone before them. Games are a 21st century outlet for normal and healthy aggression.

One objection I've heard to video games is that they are a "realistic" depiction of violence. Is there anybody out there who would claim they thought the movie "Final Fantasy" used real actors? However impressive they may be, modern video game graphics are five to 10 years behind the movie industry in the technology of 3-D realism. When I am sitting on my butt watching a 19-inch computer screen while driving a virtual character around with a computer mouse and keyboard, I am not having a realistic experience. The realism is provided by my imagination, always a dangerous thing; unfortunately it is just as good at conjuring up violent imagery from reading a book. For some odd reason, books have no ratings, but movies and games do. Are books really less realistic and less likely to convey dangerous ideas?

Some say that people's appetites for violent game content after 9/11 have dried up. I think there are a lot of people with an appetite for revenge that will never get their hands on Osama bin Laden. I hope the media industry supplies them with lots of movies and games that satisfy that need. I'm far more worried about what people without such avenues of expression will do to vent their frustration. ■

Speak your mind: TheSaint@cpumag.com.

WELCOME
TO YOUR



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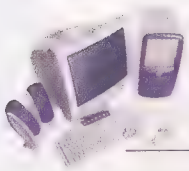

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EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

Whether you call them the First Decade, the Zero Years, or the Aughts, the years 2000 to 2009 are shaping up to be the prime time for extreme hardware. With the funky gear we've uncovered this month, you could fling your digital video wirelessly through the ether, record MP3s as easily as you use a tape recorder, or make your server as zippy as a rocket. When you're ready for something more tangible, like a Hot Pocket, you can always tell your microwave to cook it for you—through an SD card, of course. After all, why leave your powergeek credentials at the kitchen door?

by Marty Sems

Olympus 3D ScanTop

Remember the days of sitting cross-legged on your bedroom floor, grooving to the vibes of the Monkees on your turntable and the glow of the candles flanking it? Of course not. You're probably too young. Somebody at Olympus must, though, judging by the design of this 3-D scanner (www.olympus.com/3d). The $4,995 3D ScanTop's got to do its own thing, man, which is to take the heaviness out of getting 3-D images into your computer. Just plunk your artistic subject (lighter than a coed, please) on the turntable, set the mood lights, and let the 3D ScanTop sit and spin. It will snap photos and hash together a high-res 3-D model ready for export in formats such as VRML, Olympus' SPX, Alias/Wavefront's OBJ, 3D Studio's 3DS, and AutoCAD's DXF. Far out.

Matsushita NE-SD10

We've heard Sun Microsystems Chairman/CEO Scott McNealy's vision of Java-enabled appliances. We also remember hearing how Web appliances, such as the Audrey, would become as essential to the kitchen as toasters. But this bakes the cake. (OK, cheap pun.) Matsushita's NE-SD10 "Cooking Master" microwave oven comes with a 3.8-inch color LCD and, get this, a SD memory card slot. The 8MB card that comes with this lovin' oven holds 365 recipes and, more importantly for some of us, culinary advice. With the SD card playing Emeril Lagasse, the NE-SD10 can even cook your ingredients with preprogrammed time and power settings. Other recipe cards are available. Matsushita says it doesn't have specific plans to market the NE-SD10 in the States, but it's available in Japan for about a grand (www.panasonic.co.jp/global/top.html). But don't blame us if your Hot Pocket comes out tasting like sushi. Hoo-wee!

Cambridge Consultants SEE Camera

Why muck around with tapes or memory cards in your digital camcorder? Why labor to upload your digital video to your PC through a cable? The UK's Cambridge Consultants must have grown fed up with all that rot because its SEE digital camcorder records video straight to your server's hard drive, wirelessly. The company says the rechargeable SEE can record up to 100 still pics or 30 minutes of video on one battery charge. The SEE even has a touchscreen with a stylus, so you can mark up your real estate or battlefield-intelligence photos before beaming them back to HQ. Of course, there are a few catches. One is that the SEE requires a UMTS (Universal Mobile Telecommunications System) 3G network, which you'll be hard-pressed to find stateside, although the SEE could be made to work with Bluetooth or other standards. Another catch is that the SEE is just a concept device and not yet for sale. Cambridge Consultants has no plans to market it but hints that others could license and build it (www.cambridge-consultants.com).

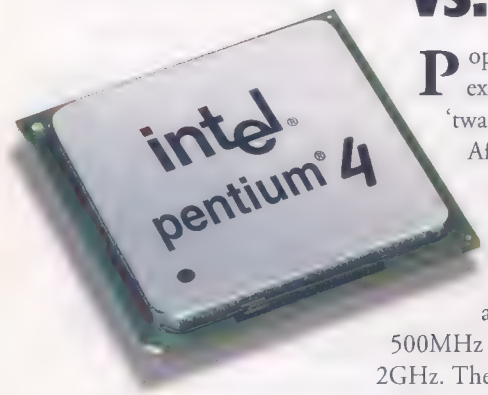
Cenatek Rocket Drive

Growing up in the shadow of such icons as Ray Bradbury, Neil Armstrong, Rocket J. Squirrel, and Ziggy Stardust, we equate the word "rocket" with unearthly power and speed. OK, insert your own Elton John gag here, Rocket Man. The Cenatek Rocket Drive 4GB (less than $5,000) is a PCI card with PC133 SDRAM memory modules that's designed to behave like an 80MBps to 132MBps hard drive as far as your OS is concerned. Because RAM is still faster than any hard drive, the Rocket Drive (www.cenatek.com) can make your server content, swap file, or games blast off. Our Rocket Drive had two power sources for reliability—the PCI bus and an external power adapter—but Cenatek says production units will also have onboard NiMH batteries. Regardless, you'll still want a UPS upstream. Cenatek says upcoming versions may be bootable and/or include the ability to back up data to your hard drive. There's even an 8GB model on the gantry. If your space program is underfunded, put a smaller Rocket in your pocket with prices as low as $999 (512MB).

Archos Jukebox Recorder 20

Danger, Will Robinson. The following product may be too cool for human life. Archos is a company happily obsessed with portable hard drive gadgets, such as its Jukebox MP3 player (www.archos.com). The company realized that the one thing separating run-of-the-mill music players from true freakin' awesomeness is that they couldn't record directly to MP3 format. So Archos built players that can. Its Jukebox Recorder 20 should be available for about $369 by the time you read this, we're told; a 6GB model ($349) is already here. The Recorder 20 can record and encode up to 160Kbps MP3s on the fly through digital or analog line-input jacks or a built-in mic. And you won't need a B9 robot's patience to fill its cavernous 20GB with about 5,000 songs from your PC, thanks to USB 2.0.

Intel Northwood Pentium 4 vs. AMD Athlon XP 2000+



Pentium 4 2.2GHz
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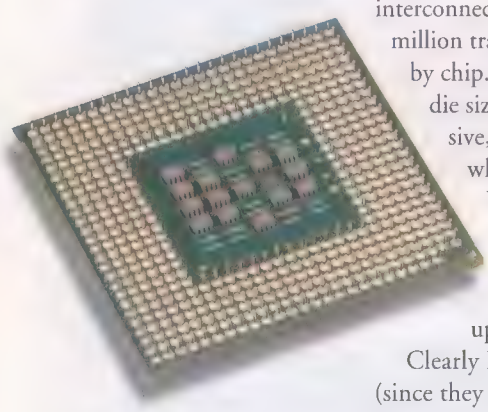

Pentium 4 2AGHz
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www.intel.com
Very fast, affordable, and the best overclocking potential in ages

Popular perception is that 2001 wasn't exactly an outstanding year for Intel; 'twas a great one for AMD, though. After years of dominance over AMD, Intel finally relinquished the performance crown to the Athlon XP, which not only outperformed the Pentium 4 clock for clock, but was amazingly competitive even at some 500MHz less than Intel's then-fastest P4 2GHz. The kicker: The Athlon XP was significantly cheaper, too.

Times might well be a changin' as the CPU wars get off to a raucous start in Q1 2002. This month sees the introduction of Intel's newly revamped Pentium 4 based on the 0.13-micron process core code-named Northwood, and AMD is ramping up with the release of yet another Athlon XP.

Willamette vs. Northwood: what's new. The original P4 is based on a 0.18-micron fabrication process Willamette core using aluminum interconnects, with 256KB L2 cache and 42 million transistors. The result is a rather chubby chip. Manufacturing its large (217mm²) die size on 200mm wafers proved expensive, so fewer chips could be made, which is certainly reflected in the Willamette P4s' high price. The die shrink to a new 0.13-micron process Northwood P4 core answers this economics glitch and ups the performance ante.

Clearly Intel is trying to make a blonde (since they have more fun) out of a mousy brown. Price, performance, and brand name alone haven't been enough to make the P4 as widely accepted as Intel had hoped. So, ciao Willy (P4 Willamette), and you can keep your aluminum, too, because Northwood P4s have copper interconnects with low-k dielectric material, which reduces crosstalk.

Northwood's die-size is dramatically smaller at 146mm², allowing Intel to improve P4 yields (the company can now make more chips per wafer), thus saving on manufacturing costs. Intel should theoretically be able to manufacture nearly twice as many P4s per 200mm wafer as they had previously, thanks to the Northwood core.

Cool down. Smaller die sizes also allow for higher frequencies and better heat dissipation, which should induce overclockers into nirvana-like, joystick-wagging frenzies. The Willamette P4 2GHz runs at 1.7 volts dissipating 78 watts of heat, whereas the Northwood P4 2GHz slashes down nicely to 1.5 volts dissipating 49 watts. This technological breakthrough is also going to be reflected in a much-needed price drop for the P4, making it more affordable to the masses. You know, so uncle Albert isn't left so much out of pocket this time around.

You could say that since Intel introduced the P4, the company has been putting the CPU through a strict low-fat Tae Bo workout diet attempting to get more muscle. Or you could say that Intel's engineers have awakened to the real threat posed by AMD and tried to address P4 critics' concerns. The die-shrink has shaved off some of the fat, allowing for the addition of more performance-muscle in the form of 256KB L2 cache, now totaling 512KB. Hence the transistor count, featuring the world's smallest (60-nanometer) transistors, according to Intel, is up to 55 million. (But I lost count after awhile.)

P4-naysayers have been crying out for more L2 cache, due to the Willamette P4's poor clock-for-clock showing against Athlon XPs. The Northwood increases the P4's IPC (instructions per clock cycle), making it more competitive with Athlon XP. The rest of the previous P4 core remains intact with Northwood, so you get all of the same NetBurst fluffadge (Hyper Pipelined Technology, Advanced Dynamic Execution, Rapid Execution Engine, Execution Trace Cache, Enhanced FPU, and SSE2 [Streaming SIMD Extensions 2] Instructions) as with the Willamette.

The memory debate. Willamette P4s are based on the 423-pin design, which wasn't exactly upgrade-friendly, so for Northwood, Intel's using a 478-pin design. Pins are great as long as you know where to stick them, right? Previously, P4s coupled with DDR-SDRAM were declared a no-fly zone by Intel. That meant that owning a P4 meant having to go with a pricey RDRAM

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

platform, though VIA made an end-run attempt that led to a nasty scuffle in the courts and enthusiasts jumped all over the RAMBUS hate/conspiracy theory.

Now, perhaps due to pressure or just common sense, Intel has acquiesced to the reality that DDR-SDRAM is the favorite among enthusiasts and the most cost-effective in terms of performance. Thus, the only way for Intel to make P4 more seductive to high-end users was to issue a new platform that supported DDR-SDRAM. Enter the enthusiast-friendly DDR-SDRAM platform, the Intel 845 (code-named Brookdale), which hits the spot. For value segments, P4s can actually be paired with even cheaper SDRAM because the Intel 845 supports it. For those of you who don't mind coughing up the extra money for RDRAM, you can still pair a P4 Northwood with an Intel 850 chipset and RDRAM, where you will likely eke out more performance under certain instances, such as Adobe Photoshop and Quake III. Just don't expect your techie-friends to be pals with you any more. . . .

On an Intel 845 platform, the P4 is maxed out (for now) with single channel 266MHz DDR-SDRAM, but a dual channel chipset code-named Granite Bay isn't far off. More improvements to the P4's system bus, currently a 400MHz (Quad-Pumped 100MHz) FSB will likely be bumped to 533MHz (133MHz x 4). Taking this into account with the incredible scalability of the Northwood P4, and Intel might well get a clear performance delta. AMD has to play catch-up where 0.13-micron and all of the technological benefits that go with it are concerned.

AMD's offering. There's not a whole lot of "new" (your homework this month is to look back at Athlon XP reviews in previous issues) to say about the Athlon XP 2000+, other than an increase of 66MHz over the previous fastest 1900+. At 1.67GHz (12.5x clock multiplier), the CPU is once again based on the 0.18-micron Palomino core, so the en suite QuantiSpeed architecture caboodle is fully-inclusive.

The XP 2000+ runs hotter than the Northwood P4, with a 1.75-volt core dissipating up to 70 watts. AMD will combat this, as well as attempt higher clock speeds, by introducing its own 0.13-micron based Athlon core, code-named Thoroughbred. Until that happens, the fastest available CPU from AMD is the 2000+, and despite its MHz difference with the Northwood P4 2AGHz and P4 2.2GHz, it actually keeps up in many benchmarks. (It even beats Intel's CPUs, depending on which tests you look at.)

The verdict. The final word is as cloudy as your average San Francisco day. The approximately 10% performance boost that the Northwood core delivers over Willamette has brought the P4 back into the Athlon XP's radar range. But the performance delta between the P4 2.2GHz and Athlon XP 2000+ is negligible, and some games, such as Quake III, have historically done better on the P4 anyway, whereas Serious Sam has never taken to the P4 particularly well.

The $25 difference in price between the P4 2AGHz and the cheaper XP 2000+ isn't that significant, but the P4 2.2GHz, although slightly faster than the other two candidates, rules itself out of the running (unless money is no object), being $198 more than the P4 2AGHz. If you want the best bang for your euro (buck is now so passé), the Athlon XP 2000+ is still probably the way many enthusiasts will go. It's cheaper than the rest of the pack and keeps up with the Northwood P4 2.2GHz in some benchmarks. But if money is no object, and you just have to own the fastest ride in the west, then the 2.2GHz P4 will fleet your switch.

A far more seductive reason to opt for the Northwood P4 is if you happen to attend Kyle Bennett's International School of Overclocking Excellence (KBISOE) at www.hardocp.com. A clock-throttling mechanism and an integrated heat spreader make the P4 Northwood less likely to suffer from heat disorders, and the fact that the P4 2AGHz can easily reach 2.7GHz with no fancy cooling certainly takes me back down memory lane to the good old days of the Celeron 300A. Not since then have overclockers had it so good, and being a full-time student at Kyle's school, I simply can't ignore the P4 2AGHz, which is my personal preference this go-round. ▲

by Alex "Sharky" Ross

Athlon XP 2000+
$339
AMD
www.amd.com
Keeps up with the Northwood and costs less, too

"The die shrink shaves off some fat"

Northwood & Athlon XP Benchmarks

Despite the difference in MHz, the Athlon XP 2000+ actually beat the Northwood in some of our tests

	P4 2AGHz	P4 2.2GHz	XP 2000+
3DMark 2001	8028	8129	8037
SYSmark2001	204	218	210
Quake III	255.7	272.2	250.3
Serious Sam	107.3	115.2	133.2
Max Payne	57.8	61.3	62.6

*Tested on WinXP Pro

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

CPU First Look

Intel Pentium 4-M

Pentium 4-M
$1,500 to $3,000 for P4-M-based notebooks
Intel
(800) 628-8686
(408) 765-8080
www.intel.com
Preview: No Rating

Intel and AMD aren't just exchanging blows on the desktop front with the Pentium 4 and Athlon XP, respectively. While desktop sales had a rough time in 2001, thanks to a sagging economy, the notebook arena actually helped to prop up overall PC sales figures during the holiday season. Both chip manufacturers are fully aware of and largely responsible for this.

Even though the Moore's Law curve for faster processors in the mobile sector isn't quite on the same wavelength and some 12 months behind that of the desktop sector, the gap between notebook and desktop performance is decreasing. Desktop replacements are all the rage and currently being powered by either Pentium III-M 1.2GHz or Athlon 4 (mobile Palomino) 1.2GHz CPUs. 2002 will see Intel shift into higher gear with the introduction of a long-awaited mobile P4 part.

Pentium 4-M is based on the same Northwood 0.13-micron process (incorporating low-k dielectrics reducing capacitance) as the newly released desktop Pentium 4As. This process breakthrough is important to Intel. Boosting yields while dropping costs, reducing chip power consumption, allowing for price flexibilities, and ramping up speed during a sagging economy are exactly what the doctor ordered.

What's inside. Housed in a flip-chip PGA (Pin Grid Array) package with 512KB of on-die L2 cache, the P4-M will include the same NetBurst microarchitechture and streaming SIMD (Single Instruction Multiple Data) extensions as in the desktop P4. Intel's SpeedStep technology (a la mobile Pentium IIIs) will drop the P4-M's clock speed, which will help to extend battery life on notebooks by lowering system voltage by approximately 20%. You know, so you can watch an entire DVD without having to plug into a wall.

A new CPU release brings a new chipset to go with it, and in this case, Intel is coupling the P4-M with the 845MP (carried over from the desktop Brookdale 845 chipset) platform. The 845MP will sport a 400MHz system bus, effectively 100MHz Quad-pumped with the P4-M running a 100MHz FSB. The chipset will support SDRAM and the higher-performing DDR-SDRAM with a maximum bandwidth of 3.2GB per second.

Critically speaking. But even before the chip's release, critics have sprung up, as they do, indicating that the chip itself, which may require an additional cooling fan, may not be particularly viable for the mobile sector. Critics also say the chip probably won't be seen in smaller, thinner, lightweight mobile PCs. The fact that the P4-M will consume more wattage than the PIII-M means the P4-M will require larger batteries, which are, of course, heavier.

Some critics think that only bulkier two/three-spindle units will be able to accommodate the requirements of the P4-M. The latest reports point toward a mobile-specific chip slated for 2003. Being developed in Israel and code-named Banias, this project is rumored to be designed for mobile from the ground up, as opposed to the customary porting of desktop parts and packaging them for the mobile market.

Up next. So where does this leave the venerable Pentium III-M Tualatin? Well, current roadmaps suggest the PIII-M is scheduled to be phased out by the end of this year. However, the Tualatin will continue in the form of a mobile Celeron 1.3GHz part for the value sector in Q2. To top things off, Intel is rumored to be on tap for a Q4 release of a Celeron 1.5GHz, based upon the 0.13-micron process.

Intel's had a rough ride in 2001, with AMD gobbling up market sectors in the mobile market, long reserved for the big I. Thus for 2002, Intel, seemingly with a much stronger lineup, is set to let loose with P4-M 1.4GHz, 1.5GHz, 1.6GHz, and 1.7GHz entry-level speeds in the first half of 2002, with 2GHz likely to be on target by the year's end. By the time spring comes around, Dell, Toshiba, IBM, and Gateway should all have P4-M-powered notebook packages ranging from $3,000 for the high-end 1.7GHz to a more affordable $1,500 for 1.5GHz. When coupled with a top-notch 3-D accelerator, such as the NVIDIA NV17M or ATI's Mobility Radeon 7500, portable gaming PCs will be much better equipped to deal with today's high-end game system requirements and thus more deserving of the much abused "desktop replacement" title. ▲

by Alex "Sharky" Ross

Avocent SwitchView

Avocent's SwitchView is a top-notch, plain-Jane KVM (keyboard/video/monitor) switch. If you were expecting some extra letters to follow the device's moniker, you're thinking of the SwitchView DT (desktop), MP (multiplatform), OSD (on-screen display), or SC (secure data transfers) varieties. I tested the standard 4-port SwitchView; Avocent also makes a 2-port version.

Attaching the SwitchView to two PCs required little effort; the device comes with a manual on CD just in case. The device is hot-pluggable, but I powered down the PCs before adding connections. SwitchView doesn't require its own power source; it uses the PCs to power its indicator lights.

A single button on the SwitchView's front panel switches the monitor, keyboard, and mouse from one PC to another. To make switching even easier, SwitchView supports a number of keyboard shortcuts. For example, press CTRL twice, B, and ENTER to switch from the first connected PC (A) to the second (B).

SwitchView also has a variety of scanning features, all of which worked superbly. The device requires four keystrokes to begin scanning from one PC to the next every five seconds; throw in two extra keystrokes, and you can set a different frequency, anywhere from two to 60 seconds.

SwitchView supports IBM PC/AT, PS/2, and compatibles. For video, the device supports VGA and SVGA, a 1,600 x 1,200 maximum resolution, and a 75Hz maximum refresh rate. SwitchView also supports Logitech's MouseMan Wheel, TrackMan Marble Wheel, and TrackMan Marble FX and Microsoft's Explorer Mouse and IntelliMouse.

The SwitchView package includes two cables, each with color-coded PS/2 and VGA connectors; this makes the $169 purchase price a bargain. Avocent sells additional cables for $29 each. ▲

by Cal Clinchard

SwitchView
$169
Avocent
(866) 286-2368
(256) 430-4000
www.avocent.com

CPU CPU CPU

StarTech Ultra IDE/66 Aluminum Drive Drawer

One of the litmus tests you must pass before declaring yourself a computer geek is you must covet this product. I had no idea how nerdy I had become until I laid eyes on this fine aluminum beauty and went, "Oooooh."

If you've ever come home to find your roommate nervously running ScanDisk on your PC because he's not sure what was in that weird attachment he just opened, you need a removable hard drive. Lock up your boot drive while you're out, and see how much trouble your beloved roomie can get into with nothing but DOS games on floppies. A removable hard drive is also a good idea if you're worried about a little corporate espionage. Alternatively, you could use a removable secondary hard drive as a quick backup medium, although you would have to treat it very gently once out of your PC.

Any quality removable hard drive kit can do this for you. But if you're a real geek, you know that cool is cooler. Your 7,200rpm EIDE drive doesn't run as hot as 10,000rpm or 15,000rpm SCSIs, but you could still extend its life with proper cooling. That's why StarTech's IDE66PRODRWR for any EIDE interface ($112) deserves one of your precious 5.25-inch bays.

The StarTech's caddy and drawer are both made of sturdy, cast aluminum, which passively leaches away your hard drive's heat. Up front, two ball-bearing fans take an active role. Two included keys lock the caddy in the drawer for security and safety. Extra caddies are $105.

The entire kit is an easy install. I even found that I could mount a low-profile drive in the caddy with space above and below it. This let it have maximum exposure to the fans' airflow. This is a quality kit in fit and function—but your roommate will still hate it. ▲

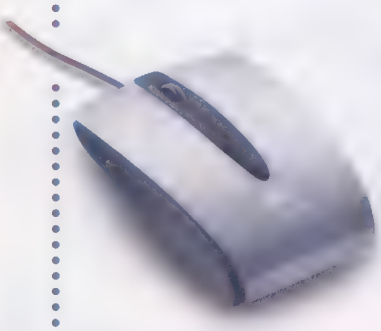
by Marty Sems

Ultra IDE/66 Aluminum Drive Drawer
$112
StarTech
(800) 265-1844
(519) 455-9675
www.startech.com

CPU CPU CPU CPU CPU

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

Logitech MouseMan Traveler



MouseMan Traveler
$49.95
Logitech
(800) 231-7717
(510) 795-8500
www.logitech.com

CPU CPU CPU

You don't necessarily love trackballs or tiny touchpads just because you tote a notebook computer. You avoid using a mouse because it's not worth toting a giant electronic rodent around. But Logitech's MouseMan Traveler may change your mind.

With a 1-inch high x 2-inch wide x 3.29-inch long body, a weight of 3.2 ounces, and a bundled carrying case, you can lug the MouseMan Traveler with you pretty much anywhere without damaging it. The USB mouse's package includes a PS/2 adapter and a 3-foot extension cable (for use with your desktop PC). You can download WinXP drivers from Logitech's Web site.

Of course, its tiny size isn't the only thing that makes this mouse portable. The MouseMan Traveler can also operate on whatever surface you encounter in your travels. Because the mouse has an 800dpi optical sensor, you don't need a mousepad. In fact, the mouse responded accurately when I used it on a variety of surfaces. Even if you're forced to operate the mouse on your leg or a less-than-smooth, less-than-clean airline serving tray, the MouseMan Traveler should function well. My only real concern with the mouse's performance was that the scroll button ground slightly when I scrolled downward, but the pointer still responded OK.

This symmetrical three-button mouse has 49 programmable button options, including Logitech's WebWheel. You can use it for quick access to your browser's Forward, Back, Stop, and Refresh buttons. You can also program it for quick access to your favorite Web sites.

Overall, I was very impressed with the comfort of the mouse's design and its bundled extension cord and carrying case. Those who yearn for their desktop mouse while away from home may find the MouseMan Traveler a perfect traveling companion. ▲

by Kylee Dickey

Logitech MouseMan Dual Optical

MouseMan Dual Optical
$49.95
Logitech
(800) 231-7717
(510) 795-8500
www.logitech.com

CPU CPU CPU CPU

The optical mice scurrying through the pointing device market "see" where they're going by using an optical sensor capable of at least 1,500ips (instructions per second). Logitech's MouseMan Dual Optical is no "one-eyed" mouse, however. Instead, it has two optical sensors, each operating at 2,000ips, which photograph the surface from slightly different angles.

When you flip over the two-toned gray mouse, you'll see the two sensors. In addition, there's right, left, and scroll buttons, plus a small thumb button. All four buttons are programmable, with 53 choices for each button. I especially liked that I could configure the button options to carry out function key tasks, giving me the freedom to really customize the mouse.

The MouseMan Dual Optical's sides curve slightly inward, giving the grip a very natural feel. The Microsoft IntelliMouse Explorer might have a more obviously contoured, ergonomic design, but the MouseMan Dual Optical was more comfortable for my small- to medium-sized hand, letting my fingers automatically rest on the correct buttons. Comfort is a matter of individual taste, though, and those with larger hands might be more comfortable with Microsoft's design.

I was amazed at how fluidly the MouseMan's pointer moved. It responded exactly as I expected based on mouse movements. In fact, the Dual MouseMan may be the most responsive mouse I've tested.

A mouse with two sensors may be enough reason for some users to purchase the MouseMan Dual Optical. And flipping the mouse upside-down to reveal the two red LEDs could be a great conversation starter. But the second sensor seems to be more than a gimmick, as this mouse has the smoothest pointer response I've seen.

The MouseMan Dual Optical connects through a USB port and bundles a PS/2 adapter. The mouse is Windows XP-compliant and comes with a 5-year warranty. ▲

by Kylee Dickey

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

If you think it looks different, wait until you hear it.

The Bose® Acoustic Wave® music system. A sound difference.

Touch a single button on this acclaimed, all-in-one music system – a system the size of a briefcase. You'll hear "big, bold sound" that places it "at the forefront of compact music systems," according to the *Chicago Tribune*.

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All of which is quite remarkable when you consider this simple, one-piece stereo system measures just 10.5"H x 18"W x 6.5"D. It fits just about anywhere, whether at home or in the office. And, with a choice of colors – Platinum White or Graphite Gray – it fits any décor.

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The key to this sound is our patented waveguide speaker technology inside. And only Bose has it. Just as a flute strengthens a breath of air to fill an entire concert hall, the waveguide produces room-filling sound from a small enclosure. It's a revolutionary concept that won its team of Bose engineers the prestigious "Inventor of the Year" award.

Folded inside, our patented seven-foot waveguide enriches sound.

Easy-to-use features.

The system is technologically advanced, yet remarkably easy to use. The CD player, AM/FM tuner, and three speakers are all built in, so you'll have no wires or external speakers to hook up. Simply plug it in and press PLAY. There's even a handy credit card-sized remote.

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Order by March 31, 2002 and get a free Pedestal with inputs for your TV, VCR, cassette deck, and one other music source. The Pedestal is a $149.95 value that allows you to hear just how different a stereo this small can sound.

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BOSE®
Better sound through research®

Zippy Technology IR-710

IR-710
$60
Zippy Technology
(949) 366-9525
www.zippy.com.tw

The main difference between Zippy Technology's IR-710 wireless keyboard and some of its similarly priced competitors is it's a little cheaper and uses an IBM TrackPoint instead of a mouse. (Yes, that's the same TrackPoint you'll find on IBM ThinkPads.)

Whether you need the IR-710 instead of a different sub-$100 wireless keyboard depends on your needs. You can, for example, pay $20 more than the IR-710's $60 estimated street price to purchase Logitech's Cordless Freedom iTouch, which uses RF (radio frequency) rather than the IR-710's IR (infrared) for communication between the keyboard and the receiver unit. The iTouch doesn't need a line-of-sight between keyboard and receiver, but it includes a separate mouse plus hotkeys and software you may not need.

I set up the IR-710 in less than two minutes, and it worked great immediately. The TrackPoint is far from speedy, which will undoubtedly frustrate mouse-intensive users. The IR-710 is ideal for users who know their way around function keys or want a wireless keyboard primarily for business presentations, controlling a media player, or similar functions.

I spent a few minutes more installing the driver (included on CD) to make the 16 multimedia buttons functional. Included are Web browsing and media player buttons (all of which worked perfectly) and a programmable hotkey (which was beyond easy to set up). The 1.5-pound IR-710 has plastic casing with a shiny silver finish and works well from over 20 feet from the receiver.

If you're interested, contact Zippy's U.S. office (phone number at left) to find the best reseller. I found the IR-710 selling for less than $60USD from resellers based in Australia, but of course, overseas shipping and handling costs jack up the price. ▲

by Cal Clinchard

Casio Cassiopeia Pocket Manager BE-300

Cassiopeia Pocket Manager BE-300
$200
Casio
(888) 204-7765
(973) 442-5707
www.casio.com

Although Casio is best known for its Pocket PC devices, the company is no stranger to PDA experiments. Casio's latest PDA experiment, the Cassiopeia Pocket Manager BE-300, is a sort of hybrid. At its heart is Microsoft's Windows CE 3.0, but the BE-300 lacks the interface and supporting software of a full-fledged Pocket PC. Instead, Casio developed its own interface for the BE-300 and a few custom applications. Pocket Word, Pocket Excel, Microsoft Reader, and Windows Media Player are not included.

The interface consists of a list of submenus and applications. A single tap highlights an application or submenu. Once highlighted, you can move or delete the selection using the Edit button in the upper-left corner. To open an application, tap it a second time. In addition, the BE-300 is not compatible with software written for Cassiopeia Pocket PCs. Theoretically, it should be easy for third-party developers to port applications to the BE-300, but there's no guarantee they'll take the time.

There are some things about the BE-300 I like. For instance, all applications are stored in flash memory. This means it's virtually impossible to lose your data. Because the OS and included applications take up some room in flash memory, you'll have a bit less than 16MB of storage with which to work. The 16MB of RAM included with the system is used strictly for running applications, not at all for storage. A CF card slot provides removable storage, which you'll need if you want to play back MP3 files using the included MP3 Player.

Despite some of its good qualities, there are just too many things I dislike or question about the BE-300. A more active software community would help tremendously. It's hard to recommend a $200 device instead of similarly priced Palm OS devices that have more available third-party software and a better interface. ▲

by Chad Denton

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Casio Cassiopeia E-200

With each new generation, the Pocket PC platform seems to improve. This is partly due to Microsoft fine-tuning its software and partly to advances in hardware. Faster processors and lighter color displays make Pocket PC devices not nearly has hefty as they used to be.

Casio's older Cassiopeia's were certainly powerful, but they were somewhat heavy. Casio's latest model, the Cassiopeia E-200, is just slightly smaller than older models, but it's nearly 3 ounces lighter.

The E-200 utilizes a 206MHz Intel StrongARM processor instead of the MIPS-based processors older Cassiopeia devices used. As a result, you may have trouble running applications written specifically for older Cassiopeia Pocket PCs. Also, Casio's backlit TFT display has been replaced by a reflective TFT display that provides a vibrant screen in a variety of lighting conditions, including direct sunlight.

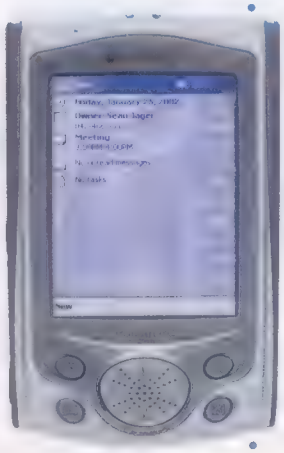
The E-200's 64MB of RAM provides plenty of internal storage; 32MB of flash memory lets you upgrade the E-200 with future versions of Microsoft's Pocket PC software. The E-200 includes both a CF slot and an SD slot for external expansion.

The centerpiece of the new E-200 is its Pocket PC 2002 software, featuring an interface that sports a similar look to Windows XP. Applications include the typical Pocket Outlook applications you would expect (Calendar, Contacts, Notes, Tasks, and Inbox), plus Pocket Word, Pocket Excel, Windows Media Player, and Microsoft Reader.

According to Casio, battery life is roughly 12 hours. The E-200 includes a serviceable battery, meaning you can replace it with a new battery should it wear down.

The E-200 is a breath of fresh air coming from Casio, which, until now, has been content to stuff hardware and software updates into the same shell for the last several years. The new design is rounder, softer, and generally more attractive. ▲

by Chad Denton



Cassiopeia E-200
$599
Casio
(888) 204-7765
(973) 442-5707
www.casio.com

CPU CPU CPU CPU

DigitalPersona U.are.U Personal

With the launch of WinXP, plenty of companies are introducing innovative products to take advantage of this OS' advanced functionality. One of the coolest gadgets I've seen is the U.are.U Personal, a biometrics security system that identifies people by using their fingerprints.

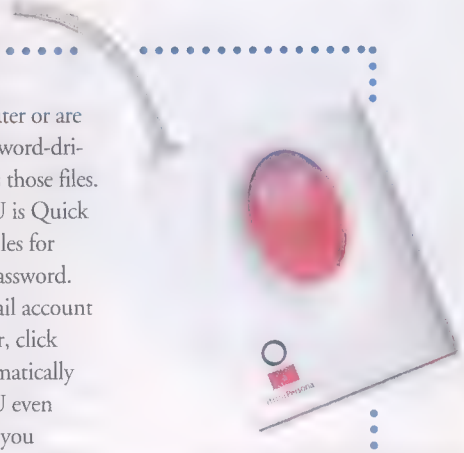
With U.are.U, one slip of your finger gives you access to your sensitive data. To begin, you run through quick software installation and launch the Finger Registration Wizard. Press the USB-connected sensor four times, and you are done. If you have more than one password-protected user account, just switch users and start the process again. Once all users are registered, you can switch back and forth between accounts by touching the sensor.

After you've loaded your user account and touched the sensor again, a pop-up menu appears. One feature that jumps out is Encrypt. It lets you protect files and folders, and anyone who does not supply the correct fingerprint cannot access these areas. Decrypting files is just as easy, and if you move an encrypted file to another computer or are otherwise unable to use the sensor, a password-driven recovery utility will still let you access those files.

One of the flashier features of U.are.U is Quick Links. This function lets you create profiles for Web sites that require a username and password. For example, you can access your Hotmail account using one finger touch. Touch the sensor, click your Hotmail profile, and U.are.U automatically inserts the required information. U.are.U even sends an ENTER key command to take you straight into the account.

For the most part, the system works smoothly. However, I had to repeatedly touch the sensor if I didn't place my finger at the proper angle, and it took a lot of extra effort to set up separate user accounts after I inadvertently skipped a step. But if your computer world needs simple security, the U.are.U is an inexpensive fix. ▲

by Nathan Chandler



U.are.U Personal
$99
DigitalPersona
(877) 378-2738
(650) 261-6070
www.digitalpersona.com

CPU CPU CPU

CPU Ranking: 0 = Absolutely Worthless CPU CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

AmbiCom PowerSaver 16-Bit 10/100Mbps Fast Ethernet PC Card

PowerSaver16-Bit 10/100Mbps Fast Ethernet PC Card
$49.95
AmbiCom
(510) 249-0581
www.ambicom.com

AmbiCom's PowerSaver AMB8110 is a fairly inexpensive PC Card full-duplex LAN adapter that can tie your notebook into an existing, wired Ethernet network. As expected, it can automatically sense 10Mbps or 100Mbps networks and adapt accordingly. The best part about a 16-bit PC Card is it's pretty much guaranteed to work in any Type II PC Card slot. However, 32-bit, or CardBus, PC Cards can facilitate higher speeds in compatible notebooks.

We installed the AmbiCom and its software in a Winbook Si notebook with an 850MHz PIII, 128MB of RAM, and WinMe. Everything went smoothly, and it worked just fine with our network.

The AmbiCom's drawback, especially for long-time users of PC Card peripherals, is you can't snap an RJ-45 connector straight into the card as you can with a New Media LiveWire 10/100 i-Port LAN Card ($43.99; www.newmediatechcorp.com). AmbiCom provides an adapter cable with a flat 15-pin connector on one end and a female RJ-45 receptacle on the other. To its credit, the 15-pin connector has springy tabs to keep it reasonably locked into the PC Card, which is more than I can say for the adapter cables that come with many notebook modems of this type. Still, if you lose the adapter cable, you can't use this card.

AmbiCom's warranty on this PC Card LAN adapter is five years. However, the cable is only covered for one year (ahem). The card works with a nice assortment of OSes, including ones outside the Windows fold, such as Linux, Novell NetWare, Banyan Vines, and others. For Microsoft users, this card supports Win95 OSR2/98/Me/NT3.51 /NT4/2000 and Microsoft LAN Manager. It's a decent enough LAN PC Card; I just don't like that adapter cable arrangement very much. ▲

by Marty Sems

Canon PowerShot S30

PowerShot S30
Canon
(800) 652-2666
(714) 438-3000
www.powershot.com

Tiny digital cameras often equal limited clout when it comes to feature variety. Not so with Canon's smallish PowerShot S30, which packs the meanest punch of any small camera less than $600.

This 3.2-megapixel beauty has an F2.8 3X optical zoom lens and a focal range of 7.1-21.3mm (equivalent to 35-105mm on a 35mm camera). And the S30's compact (2.3 x 4.4 x 1.7) size and tough aluminum housing make it convenient and attractive for advanced amateurs who tend to rough up their cameras.

The S30 comes with a CF Type II slot and a 16MB CompactFlash card. That's plenty of room for a lot of print-quality shots; you can store eight large photos at the SuperFine (2,274 x 1,704) setting. The S30 also stores RAW files, giving you the great quality of TIFFs but requiring only about 3MB each. You can also record about a minute of high-resolution (320 x 240) video with audio.

There are a whopping 13 shooting modes on the S30. In addition to fully automatic and flexible manual modes, there are High- and Slow-Speed Shutter modes, Stitch Assist (for panoramic shots), Night Scene, and Movie modes. In short, if you know how to use a manual 35mm camera, you can duplicate almost any of its feats using the S30.

The S30's ISO modes are actually more flexible than on the more expensive S40, as the S30 lets you manually adjust the ISO setting from 50 to 800. Playback mode is awesome, too; it lets you zoom in and pan around your shots to inspect details. A histogram lets you check on light balance, and overexposed areas of each photo flash to further alert you to lighting issues.

Picture quality is almost an afterthought with the S30; the photos I took (and printed) were superb. And the battery will let you shoot plenty; the S30 uses a proprietary rechargeable Li-Ion battery that charges quickly (80 minutes) and lasts for about 170 images with the LCD monitor turned on.

The S30 nearly rates 5 CPUs and is the best digicam deal you'll find at $600. ▲

by Nathan Chandler

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Kodak DX3700

Kudos to Kodak for simplifying its digicams for the technologically impaired. But as the DX3700 proves, oversimplification may be just as deadly a sin as making a complicated camera.

The DX3700 works with the company's Easy-Share system, which, in a nutshell, means that you can blow another $79 for a camera dock that automatically sucks photos from the camera to your hard drive. Very easy.

Taking photos is a brain-not-required activity, as well. Everything is automated; the only thing you control is the flash, Macro and Normal mode switching, and image resolution. No idea what flash does? No problem! The friendly 1.6-inch LCD explains where to use each flash mode. Don't know what the heck resolution is? Fear not! The menu forgoes "incomprehensible" terms such as 2,160 x 1,440 (the 3.1 megapixel CCD's maximum resolution) for swell descriptors such as "better" and "best." Uh, OK, that really clears things up for me. I think.

Other aspects of the DX3700 were equally confusing: A lame 3X digital zoom you access using the Select button instead of the four-way controller? No movie mode? Only 8MB of internal memory for a camera with this much pixel power? Ridiculously long between-shot pauses? Geez. Even Sony's lackluster entry-level cameras have features that overwhelm the DX3700's.

Yes, yes, the high-end CCD captures some pretty photos. That's what you wanted to know, right? Outdoor shots were very good, but Auto indoor shots were frequently underexposed. The rechargeable lithium battery is a huge plus, and the fact that you can transfer photos from internal memory to a removable flash card is cool, too. But for this kind of cash, I can get a film-based camera that seriously cooks. The DX3700 is overpriced and designed for only the greenest rookies terrified of digital technology. ▲

by Nathan Chandler

DX3700
$299
Eastman Kodak
(800) 235-6325
(716) 726-7260
www.kodak.com

CPU CPU

FujiFilm FinePix 4800 Zoom

FujiFilm recently announced a $200 price drop on its FinePix 4800 Zoom camera, giving this beauty an estimated price of only $499. At $699, this Fuji was a solid value; after the price drop, it's a fabulous bargain.

The 4800 is loaded with some deluxe features, starting with its 2.4-megapixel CCD that produces photos at a maximum resolution of 2,400 x 1,800 (interpolated). The camera's highest true resolution comes in at 1,600 x 1,200, still plenty of power if you're looking to print high-quality photos. The included 16MB SmartMedia card will store about six Fine-mode or 163 VGA-mode images, 90 seconds of video, or 30 minutes of audio.

The 3.75X digital zoom pairs up with a fast-focusing 3X zoom lens (36mm to108mm equivalent on a 35mm camera) for clear close-up shots, and Macro mode focuses from 7.8 to 31.5 inches. There are five flash modes, as well as five preset shooting modes, including Night Scene, Portrait, Landscape, Black and White, and Auto. A good manual mode gives you control over exposure, ISO settings, and white balance. There are, however, no shutter- or aperture-priority modes. Bummer.

In Auto mode, some of my indoor shots were too dark. Even our brightly lit warehouse shot, which usually comes out overexposed, was way too dark. This is a correctable problem, of course, using the exposure settings, but I wanted more automatic help. Outdoor and Macro shots, on the other hand, looked very good. Colors were all well saturated and details were superb.

It's impossible to mention this camera without gushing about its gorgeous design, which is done by the same guy who drew up the Porsche 911. The all-metal body is rock-solid, and there are two displays: one gigantic 2-inch LCD and one round window with even more information. For all the power-draining features the 4800 possesses, the rechargeable lithium battery held its ground (after a 5-hour charge).

Despite a somewhat confusing control system and a couple of lacking features, the 4800 is a great deal at its new price, and you certainly won't find a prettier digital camera. ▲

by Nathan Chandler

FinePix 4800 Zoom
$499
FujiFilm
(800) 800-3854
www.fujifilm.com

CPU CPU CPU CPU

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

Creative Labs PC-CAM 300

PC-CAM 300
$149
Creative Labs
(800) 998-1000
(408) 428-6600
www.creativelabs.com

It seems a little paradoxical that the cheaper some digital cameras are, the more they aspire to be. One example is the multifunction PC-CAM 300 from Creative Labs.

The 300 has three main functions. It works as a digital still camera, Web cam, and digital video recorder. Still photos top out at a resolution of 640 x 480, and you can also take pictures at 320 x 240; the 8MB of internal memory will store about 128 and 255 images at these resolutions, respectively. The 300 will also store 75 seconds of full-motion video with audio or, if you wish, as many as 34 minutes of straight audio.

The problem with creating such a low-cost, do-everything camera is that somehow a manufacturer has to cut costs. This often means a crucial feature, such as a flash, is left by the wayside. Not so with the 300; it comes with necessities, such as a CCD sensor, flash, USB cable, and an intuitive menu system to help you work its many functions with ease.

The 300 also comes with a focus-free lens that works from 2 feet to infinity. I snapped our typical number of test shots inside and outside of the office, and results were generally good. A yellowish cast, which is typical of lower-end cameras, marred indoor shots at times, especially when I taxed the flash's limited range. The 320 x 240 photos are nearly worthless quality-wise, but the high resolution setting is fine for Web and e-mail purposes.

This PC-CAM 300 comes with a heavy base that lets you secure it to the top of your monitor. From there, it can perform streaming video and "spycam" functions and capture video at 30 frames per second. Web cam functions are standard and work well with the included software package. ▲

by Nathan Chandler

Seagate Cheetah 36ES 36.7GB

Cheetah 36ES 36.7GB
$445
Seagate
(800) 732-4283
(831) 438-6550
www.seagate.com

Many users are on the prowl for a reasonably quick SCSI drive without the bite of a 15,000rpm unit's price. At the same time, they don't feel comfortable buying a 7,200rpm drive for server use, price break or no. Seagate is trying to make the decision easier with the midpriced, 10,000rpm Cheetah 36ES 36.7GB.

This twin-platter Cheetah comes with a 4MB buffer, a 1.2 million-hour MTBF, and a 5-year warranty. It has a 250G, 2ms nonoperating shock tolerance and a 32dB acoustic rating while idle. My demo unit was the ST336706LW version, meaning it had a 68-pin connector for the Ultra160 interface. Seagate also sells an Ultra320 Cheetah 36ES and 80-pin versions of both.

The Cheetah 36ES seemed to follow the Cheetah 73LP 73.4GB's lead in performance, although neither can touch the Maxtor Atlas 10K III 73.4GB's ($1,159.95) 7.6ms random-access time. According to HD Tach 2.61, the 36ES charted an 8.7 access time, a 49.9MBps average read rate (55.6MBps maximum), and a 31.9 average write rate (35.5MBps maximum). The drive peaked at a burst read rate of 73.3MBps.

I don't have Winbench99 scores for the 73LP I reviewed last May; however, the new Cheetah 36ES's 7,080KBps Business Disk rating and 24,700KBps High-End Disk score indicate good I/O strength for its $445 price. This Seagate looks fine for midrange or less expensive servers.

Note these scores reflect a few refinements to our testing platform. Had we tested the Atlas 10K III under the same conditions, I'm sure its Business Disk score of 4,600KBps would have looked a bit better in comparison. As it stands, the Maxtor's 25,100KBps High-End Disk rating wins the race. However, its 36GB configuration costs $579.95, so you make the call. And don't rule out the $319.95 Fujitsu MAN3367MP, which has slower read/write rates but a better access time. ▲

by Marty Sems

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Panasonic KX-P7100

KX-P7100
$349
Panasonic
(800) 742-8086
(201) 348-7000
www.panasonic.com

Panasonic is a household name, but it probably doesn't bring to mind laser printers. I set out to learn if the KX-P7100 is a well-kept Panasonic secret or just another low-cost laser.

The KX-P7100 is capable of printing on both sides of a page. The printer has parallel and USB ports, but cables sell separately. The printer has just one 600 x 600 dpi setting and an Intel 80C51-compatible processor with 2MB of installed RAM. Panasonic says that because it's a Windows-based printer, there's no need to expand the memory. If you don't believe that claim, however, consider spending a little more for the memory-expandable KX-P7105 or KX-P7110 from the same product line.

This printer produced fonts that were always dark and with great quality that didn't require a sacrifice in speed. A 10-page text file had a 0:17 (minutes:seconds) first-page-out time and printed at a 11.1ppm rate. Although my six-page graphics-and-text and three-page PowerPoint files were slower (at 9.5ppm and 7.1ppm, respectively), the printer sped up to 15ppm after printing the first page of each file.

I was not as impressed with the graphics this laser produced. In my tests, the black areas in graphics weren't consistent. At times, they were nice and dark; other times they were alternately too light or too splotchy. Like many lasers, the KX-P7100 doesn't seem destined for a marriage with high-resolution graphics. There were two cuts in the high-resolution image I printed, and the darkness of blacks varied. Grays had a noticeable pattern and changed shades too abruptly, giving the image a grainy appearance.

Despite its problems with graphics, the Panasonic KX-P7100 is a good buy. If you're looking for a duplex laser, you're not likely to find a better price. Also, the KX-P7100's graphics capabilities are comparable to other low-end lasers, and the printer gets high marks for text quality and speed, the true tests of any laser. ▲

by Kylee Dickey

SiPix PocketColor 100 Print & Share

PocketColor 100 Print & Share
$99
SiPix
(866) 888-1678
(408) 719-8888
www.sipix.com

While more established companies are cautiously contemplating the possibilities of portable photo printing, SiPix is skipping along, carelessly spewing cheap photos for anyone who wants them. The question is, of course, are you anyone? The PocketColor 100 certainly thinks you are; for 99 bucks, the faceless designation of "anyone" isn't as degrading as you might think.

The 100 is a pocket-sized photo printer that prints directly from the SiPix SP-1300 digicam or a PC via an included USB cable. This is a dye-sub-based device, meaning (let's pound the desk with excitement here, folks) that to use the 100, you get to play with delicate ribbon cartridges and slick, delicate photo paper. Parts of the 100 are fragile, as well. I opened the paper tray and—oops—off came the tray's door, right in my hand. I must learn to be more careful.

If your fingers are more agile than mine, you'll likely have the 100 printing at 203dpi in no time. That resolution rating isn't spectacular, but consider that final prints measure only 1.5 x 2.3 inches. Not bad for a go-anywhere printer running on four AA alkaline batteries (or the included AC adapter).

Lacking an SP-1300, I hooked the 100 up to our test PC and sent it some high-quality pictures. A little more than a minute later, the photo was tickling the wind, anticipating the touch of my warm fingers, so I obliged, and then began my squinty-eyed examination of said production.

After caressing the photo with my studious eyes, I came to the conclusion that the 100 works fairly consistently. By "consistently," I mean that flecks, graininess, and streaks were prevalent in every photo. Photos never came out the same way twice. Forgivable flaws for a printer this cheap, though. The 100 will probably thrill the same crowd that loves sub-$200 digicams. ▲

by Nathan Chandler

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Toshiba TLP-780

TLP-780
$5,995
Toshiba
(800) 288-1354
(949) 583-3000
www.projectors.toshiba.com

CPU CPU CPU CPU

Choosing a beverage to go with your fast food is easy. There are a number of sizes from which to choose—kiddie, regular, bladder-stretcher, and megabladder blaster, for example—to accommodate your thirst. It's the same thing with digital projectors. Well, sort of.

For its price, the TLP-780 LCD projector is right where it should be in the scheme of big-time, high-performance projectors. It offers a middle-of-the-road set of features and capabilities for a middle-of-the-road price. In other words, you get what you pay for and you get a lot for $5,995 (MSRP; street prices can run significantly lower).

Toshiba markets the projector to a corporate audience, but those willing to pay thousands for first-generation HDTV should pay attention, as well. For HDTV, DTV, and typical home theater applications, the TLP-780 provides compatibility and extremely high quality for a lot less than its $10,000 siblings.

The projector's native XGA (1,024 x 768) resolution is perfect for most uses and produced crystal clear images throughout my tests. Its maximum brightness also contributes to its price. At 2,000 ANSI lumens, the TLP-780 is bright enough to perform well even when the presentation room isn't entirely dark. For an even brighter display (one that falls in the 10,000 lumens range), expect to pay thousands more.

Hooking up the TLP-780 to a notebook PC was a breeze. Using the intuitive remote, I tried out the projector's full range of settings. Only the brightness setting required adjustment. The factory setting was fine showing "Pocahontas" on DVD, but it needed to be lightened up a little for viewing "The Matrix."

My only complaint is that the 1-watt speaker produced somewhat hollow audio. All my imaging tests yielded fantastic results. ▲

by Cal Clinchard

Acer S2W 5300U

S2W 5300U
$109
Acer
(800) 733-2237
(408) 432-6200
global.acer.com

CPU CPU CPU

If you've seen one flatbed scanner, you've seen them all, right? Acer tries to break the mold with its S2W 5300U scanner. This scanner has its good points, but it also has a few faults that keep me from calling it my favorite.

The S2W 5300U has a sleek design and a sturdy base, but the lid is quite flimsy. Once I got past that pet peeve, I noticed the five one-touch buttons on the front. They are the usual scan, scan to Web, OCR, and copy buttons, but the fifth button, scan to Palm, is what floored me. That's right, you can now scan pictures and text to your Palm or a PDA that is Palm OS-compatible. And when you press any button, it plays a different nature sound, such as croaking frogs and chirping crickets, which is a cool feature.

This 1,200 x 2,400 dpi scanner comes with 48-bit color depth and USB cable. Scan times aren't that bad. At 600dpi, a black-and-white photo finished scanning in 58 seconds, and color photos ranged from 1:22 (minutes:seconds) to 3:06. Pushed to 1,200dpi, times extended to 1:57 for the same black-and-white photo and 3:14 to 8:55 for the same color photos. The results were good but not spectacular. Don't get me wrong; flesh tones were natural and colors were bright overall, but I think they could've been better. Shadowy areas in the color photos were dark, although the black-and-white photo had good shading and detail. A text scan looked clean, but the grayscale test only picked up 17 shades of gray; our benchmark is 27 shades.

You can make changes to brightness, contrast, and curves, but in order to change the resolution and mode you have to create macros. You decide what the settings will be. For example, Macro 1 can be a color mode and 1,200dpi.

If you're looking for a scan-to-Palm scanner, the $109 price tag is an appealing model; if you don't need this feature, you should probably look elsewhere. ▲

by Catherine Geistkemper

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

Sony VAIO PCV-MXS10

Video editing seems to have struck a chord with Joe Computer User, so much so that some PC manufacturers are designing systems as home digital video studios. Sony's VAIO PCV-MXS10 is one such PC. It has an unusual design and includes video-related hardware and software you won't find in most systems.

Specifications. The MXS10 has a 1.7GHz Intel Pentium 4 processor and uses Windows XP Home Edition. The PC runs on a 400MHz bus and has a generous 512MB of RAM, which is helpful when working with video files, which are notorious for taxing system resources.

The video card in the MXS10 is a rather pedestrian GeForce2 MX with 32MB of SDRAM. The video card isn't ideal for games, but it can handle other graphics chores without any trouble. This system also includes a TV tuner. The monitor Sony sent us is a 15-inch flat-panel display designed especially for the MXS10 that includes four USB ports. However, the monitor is sold separately for a hefty $599.

Sony outfitted the MXS10 with its own brand of sound card and a two-piece speaker system. The speakers are huge, and they sound better than most two-piece speaker sets, although I'm a little surprised that Sony didn't include a subwoofer with this system, given that so much emphasis is placed on the MXS10's multimedia abilities. The MXS10 has a built-in FM receiver, which is an unusual feature for a PC.

One of my favorite features of the MXS10 is the DVD-RW drive. It writes to DVD media at 2X and rewrites at 1X. You can record video to a DVD-R and play the DVD on just about any home DVD player. The system has an 80GB hard drive, which has practically become standard equipment on high-end PCs. Sony includes a MiniDisc drive on the MXS10, which is something you don't see in a PC every day. The MXS10 has both a 56Kbps modem and a 10/100 network adapter.

Design. The design of the MXS10 is one of the most interesting I've seen in a while. The front of the case features a built-in LCD, which displays various functions such as equalizer, volume, and radio station settings.

The MXS10 has a wider variety of slots, ports, and connections than any PC I've seen. It has three PCI slots, a Memory Stick media slot, and a Type II PC Card slot. The system has one serial port and one parallel port, two USB ports, and two IEEE 1394 ports. The IEEE 1394 ports are especially useful for importing graphics and video. The MXS10 also has S/Video In/Out, Stereo Line In/Out, and even Optical connections so you can connect your PC to a variety of electronics equipment.

Performance. Although the MXS10 has more than enough horsepower for video-editing tasks, its overall performance is average. The system's Overall SYSmark2001 score of 145 is about what I'd expect from a 1.7GHz system. The Office Productivity score was 133, and the Internet Content Creation score was 158. The 3DMark2001 total score was a bit low at 2,285. Most PCs in this price range have somewhat better 3DMark2001 scores, but they also tend to have faster video cards than the one the MXS10 uses.

I dropped a DVD movie into the system's DVD drive, and the video looked very nice on the flat-panel display. The Sony speakers sounded pretty good, although I missed the deep rumbling of a subwoofer. The PC includes a remote control that is especially useful when watching DVDs.

I also played several rounds of Quake III on the MXS10. When using the flat-panel display Sony sent us, the system can only play Quake III at a maximum resolution of 1,024 x 768. But the game looks and runs great at this resolution.

Final word. If you're looking for a new system specifically geared toward video editing, it's hard to top the MXS10. It's also hard to top the system's $2,800 price tag, and that's *without* a monitor. On the other hand, this system is loaded with features you won't find on most PCs. ▲

by Michael Sweet

VAIO PCV-MXS10
$2,799
Sony
(888) 595-8246
(941) 768-7669
www.sonystyle.com/vaio

CPU CPU CPU

Features

Processor: 1.7GHz Intel Pentium 4

RAM: 512MB

Hard Drive: 80GB

Optical Drive: 2X/1X DVD-RW drive

Connectivity: 56Kbps modem; 10/100 network adapter

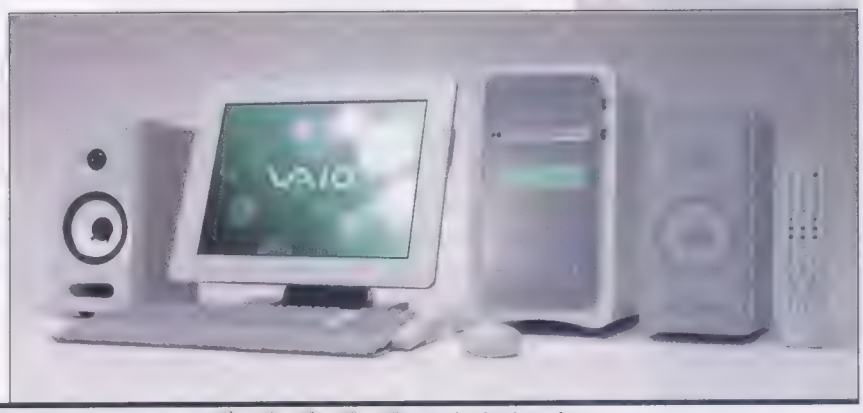
Graphics Accelerator: GeForce2 MX

Monitor: 15-inch flat panel display (sold separately)

Chassis: Mid-tower

System Use: Entertainment

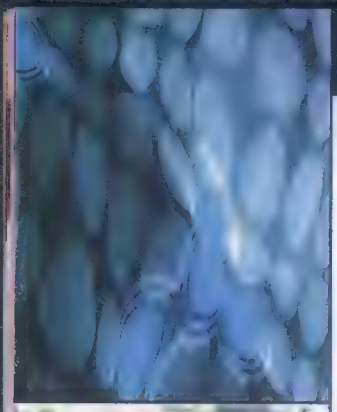
Final Word: Excellent for video editing



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Anand Lal Shimpi

Pentium 4's Future



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, *CBS' 48 Hours, and* Fortune. *His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*

Earlier this year Intel introduced its first Pentium 4 based on a 0.13-micron process. Intel employees (and tech heads alike) knew it internally as the Northwood core. Prior to Northwood, all Pentium 4s were manufactured on Intel's very mature 0.18-micron process.

There were a number of reasons to desire a die-shrink for the Pentium 4. First, the 0.18-micron Willamette die had a surface area of 217mm², which is entirely too large for a mass-production desktop microprocessor designed to completely replace the Pentium III. The move to a 0.13-micron process could easily cut that die size down by 70% or more. Intel even added another 256KB of L2 cache to increase the performance of the Pentium 4, now equipped with a full 512KB L2 cache. Second, the Pentium 4's performance comes in great part as a virtue of its ability to reach higher clock speeds than the competition. The move to smaller transistors means that they switch faster and produce less heat, allowing the CPUs to reach much higher frequencies. Finally, the smaller Pentium 4 die means more processors can be produced per silicon wafer than before, making the CPU much more economical to produce. This gives Intel more headroom when engaging in price wars with AMD, while also providing the opportunity for more profit, which is rarely turned down. Northwood's launch was met with two CPUs based on the new core: a Pentium 4 2A and a Pentium 4 2.2 processor, clocked at 2GHz and 2.2GHz, respectively. The 2.2GHz processor is approximately as fast as the Athlon XP 2000+; in some cases the XP 2000+ will be faster, while in others the Pentium 4 2.2GHz will be faster. But what about the Pentium 4's future beyond Northwood?

Intel is planning two improvements for the Pentium 4 in the not-so-distant future. First, Intel will increase the FSB (frontside bus) frequency of the Pentium 4 from 100MHz to 133MHz. Since the Pentium 4's FSB is quad-pumped (data is transmitted four times on every clock cycle), you'll often see this referred to as a 400MHz FSB that is being upgraded to 533MHz. Unfortunately none of the currently available Pentium 4 motherboards offer official support for this FSB frequency, which is a shame since increasing the FSB frequency by 33% alone will result in a 0% to 15% real-world performance improvement.

The second ace up Intel's sleeve is its Hyper-Threading technology. Without going into great detail as to why and at the lowest level, a single CPU is said to only be able to execute one thread the operating system gives it at a time. In the past, the only way around this was to move to a multiprocessor setup where you had two or four processors that could all simultaneously execute threads. Hyper-Threading technology essentially fools the OS into thinking that a single CPU can handle more than one thread at once, thus giving the CPU much more work to do than normal. The reason Hyper-Threading has potential is because most of the time the CPU's execution units (the units that do all of the work regarding executing instructions) are not being used to their full potential. There are a number of reasons why this occurs, but the point to take away is that with Hyper-Threading, the theory is that a greater overall utilization of those execution units can be realized, resulting in a boost in performance. Intel has demonstrated Hyper-Threading on Xeon CPUs before, illustrating up to a 20% boost in performance, but what's very important to remember is that the Xeon core is identical to the Pentium 4 core. Hyper-Threading may be present on the current Pentium 4 processors but not enabled, but without a doubt it will eventually be enabled across Intel's entire line of processors (except for maybe the low-end CPUs).

The combination of a 533MHz FSB and Hyper-Threading will give the Pentium 4 what it needs to remain competitive going forward.

The combination of a 533MHz FSB and Hyper-Threading will give the Pentium 4 what it needs to remain competitive going forward. Although Intel is going in a completely different direction from AMD with their interpretation of future CPUs, it's going to be a very close race—unless either company screws up tremendously. ■

Anand knows the hard stuff. Give him feedback at anand@cpumag.com.

by Alex "Sharky" Ross

FPS Fans: The PC Needs You!

I need to set the record straight after last month's ramble. My PC gaming habit may be on hiatus, but that doesn't mean I no longer geek out on PCs. As I told my Mum, PCs are for more than just games. (Of course I was fibbing back then, sorry Mum!) This month my P4 2.2GHz has become an integral part of life outside of gaming. I have been coercing friends down to the cold Santa Cruz coastline to tape my fellow geek surfing pal and I while we rip up the waves, then dabbling with MPEG-2 encoding/decoding and editing. The hardware requirements for this are actually more than you would think and fully justify the hardware expenditure, not that I would use the extra horsepower for games or anything. (Try that on your Mum/wife.) But sod it, Q1 2002 is serving up a heavy dosage of the FPS (first person shooter) genre, exactly what the doctor ordered.

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.

As a bit of a World War II buff, I stay up past my bedtime watching History Channel re-enactments. It seems ze Nazis have been having a rough time in games lately (Return to Castle Wolfenstein). Being British, recent victories are few and far between, so I find that when we do win, we talk about it way more than we should. Remember the Falklands? Thus, I've been eagerly awaiting the WWII-themed Medal of Honor: Allied Assault from Electronic Arts. Developers 2015 have opted for id Software's Quake III Team Arena engine to stage a single-player campaign taking you through six environments and 20 levels, including the Allies' D-Day invasion on the beaches of Normandy and up to the final assault on Germany. With 21 authentic weapons, including the Thompson Machine Gun and numerous usable vehicles, the Wehrmacht (with 22 ranks of soldiers) should be on the run.

Ever since Dark Forces and Jedi Knight, I've been eagerly awaiting the follow-up. Technology has advanced, and I NEED more Star Wars. Enter Jedi Knight II: Jedi Outcast, which is being developed by Raven Software. In true Raven tradition, the story promises to be well-scripted and cleverly integrated into the gameplay, picking up where Jedi Knight left off, with the return of the Rebel Kyle Katarn. The game is a mixture of first and third person, selectable depending on long range or close combat, light saber-wielding fun. Borrowing RPG elements, Kyle, who is now a Jedi, will be fully endowed with "Force Powers," a light saber, and blasters that you pick up along the way. You can even use "Jedi Mind Tricks" as long as you don't try them on Jabba or your little brother. Best of all, during multiplayer gaming, you can drop your goody-two-shoes act and cozy up to the Dark Side. Jedi Outcast is being developed with the Quake III engine, and the eye candy released so far is mouth watering. In case it goes down as well as Jar Jar at an Episode IV convention, there is still another hope: Raven Software is concurrently developing Soldier of Fortune II: Double Helix.

You can even use "Jedi Mind Tricks" as long as you don't try them on Jabba or your little brother.

Croteam isn't a household name from Texas, where all the best chicken wings and FPS games are made, but anyone who played last year's sleeper hit Serious Sam will agree that those Croatians have proved themselves. The sequel, Serious Sam: TSE, which has not been $10 million and four years in the making, looks to be more of the same. And jolly good thing, too, mindless action with waves of dummy-AI enemies, lots of humor, addictive multiplayer, three new wacky weapons (a flame thrower, chainsaw, and sniper rifle); here is a game that reminds you why Doom was so much fun. Sporting 12 levels spread across three environments, it'll keep us busy for a while. The impressive Serious 3-D engine, with a few visual enhancements, will be ready to take advantage of many DX8 features on your GeForce3/Radeon 3-D cards. At only $20, Serious Sam: TSE looks well worth it.

It's going to be a very good year for FPS' on the PC, and maybe when sheep begin colonizing Neptune, Team Fortress 2 and Duke Nukem Forever might see the light of day. Just maybe? ■

E-mail me at sharky@cpumag.com, and I'll show you my chain saw.

by Kyle Bennett

Blasphemy!

Kyle Bennett is editor-in-chief of HardOCP.com (hardocp.com), one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

Many of us power users have changed our allegiances in the last year or so. Where we used to revel in the magic of what was the overclockability and overall speed of the Intel Pentium III and Celeron lines has slipped away to something else. That "something else" is the AMD Duron and Athlon CPUs.

Where will progress take the PC enthusiast this year, though? I have a feeling many of us will be staring into the abyss, trying to assess where our next CPU purchase will lead us. You too might wake up once again with an "Intel Inside" sticker tattooed on the front of your box and could be very happy about it. Let's see why.

If you aren't familiar with RAMBUS, let me just explain that I think RAMBUS and their RDRAM plain sucks. Between their questionable business practices and price-gouging policies, it wouldn't hurt my feelings if I never see another stick of RDRAM again. Intel has embraced DDR-SDRAM, which AMD has made the norm when it comes to top-end desktop memory. In December, Intel launched their i845 chipset, which supports a once unthinkable DDR /Pentium 4 combination. VIA's P4X266A and SiS's 645, both Pentium 4/DDR chipsets, are Intel alternatives that are very much worth looking into. After testing about 10 Pentium 4 mainboards, I've found the results very strong, but it's painfully obvious that the bandwidth-hungry Pentium 4 could still benefit from a wider memory bus.

Between their questionable business practices and price-gouging policies, it wouldn't hurt my feelings if I never see another stick of RDRAM again.

Still a Pentium 4 is a Pentium 4 and many of you will cry that terrible non-SSE2 FPU performance, coupled with a price tag that reminds of us how it "used to be," will keep all of us off the Pentium 4 bandwagon, but I think things might be changing this year.

First, Pentium 4 utilizing DDR means many that have already invested in 266MHz DDR, better known as PC2100, have the memory needed to move to a Pentium 4 platform. In the past, evil RDRAM kept us at bay.

Next we have Intel finally settling on the 478-pin CPU package (Socket 478 or S478) for their upcoming CPUs. It's rumored that Intel will stick with the S478 all the way up to 4GHz on their desktop CPUs. Of course sticking with DDR and one-socket type makes upgrading that much easier down the road.

Intel now has their "Northwood" Pentium 4 CPUs on the market that come in the S478 package. If you buy a Pentium 4, this is the one you want to get. It has some features the original Pentium 4 doesn't. The L2 cache size has doubled to 512KB, and the Northwood core is built using 0.13-micron copper interconnect technology, as opposed to the 0.18 aluminum of the previous Pentium 4. This allows a 0.225volt drop in power needed to support the CPU, as well as lowering the heat output to around 50 Watts, down from over 70 Watts. All of this tech gibberish translates into possibly a highly overclockable CPU with the right mainboard. Can you say 3GHz with the great cooling and voltage tweaks?

Intel's high-end chips are still up to three times the cost of a comparable AMD flagship CPU, and I am in no way suggesting you shell out that hard-earned green right now. By mid-2002, we will see faster Pentium 4s on the market pushing the "old" 2GHz+ CPUs down in price.

The Pentium 4 transformations don't end there, though. Before year's end we're going to see two more major changes in the Pentium 4 end of the desktop market that could very well make the CPU even more attractive. The CPU's bus speed will jump to an officially supported 133MHz (533MHz collectively). The most exciting part, though, Intel will introduce a chipset, now code named Granite Bay, that will support dual-channel DDR to further fuel the bandwidth needs of the Pentium 4.

Put all of this together with the fact that software engineers will be doing more programming with SSE2 in mind (finally unleashing the now muted FPU performance of the Pentium 4 and a much cleaner upgrade path for the enthusiast), the Pentium 4 might just turn into the winner that the previous Pentiums were. ■

Talk with Kyle at kyle@cpumag.com.

Introducing the new Palm™ m500 handheld. Inside its sleek little chassis, we've added an expansion slot so you can turn it into the ultimate photo album or eBook. The optional SD cards also let you back up or increase memory, or even access worldwide travel guides. As for included applications, you can download email, import and update Excel spreadsheets, even customize and manage web content with the MyPalm™ portal. We also included mobile connectivity software—add a modem or compatible mobile phone and your information can be accessed wirelessly. It's time to mobilize.

Simply Palm™
palm.com

the last thing you bought
this expandable
had an elastic waist.

palm powered

Available at: Best Buy Circuit City CompUSA Office Depot OfficeMax Staples

SD expansion cards are sold separately and not included with handheld. SD card shown is an example of available storage capacity. Storage capacity may vary. The m500 handheld requires an Internet account, modem or data-enabled mobile phone and/or third-party software for email and Internet access, sold separately. Screen image is simulated.

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Except this month . . . Samit took a break from the fray and left our staffers to battle amongst themselves. Tempers will still flare. Tools will still fly. But this time Samit won't prevail.

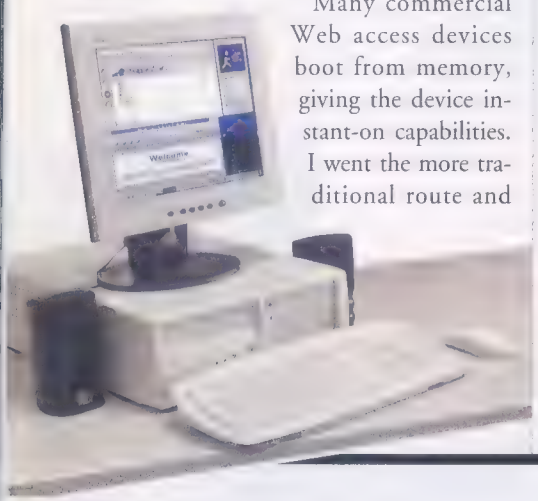
This month the challenge is to build the
Best Web Access Device for less than $750.

Chad

Building a Web access device is a bit of a challenge for any computer enthusiast. How do you tone down your natural tendency to create an awe-inspiring monument to the latest and greatest technology and just build a machine for e-mail and Web surfing? A budget of $750 does help curtail those natural geek tendencies a bit, but I found focusing on the phrase "Web access" helpful too.

A Web access device requires a different set of priorities than a typical desktop computer: Appearance is a higher priority. Instead of hiding in an office or study, a Web access device is meant to be readily available in the kitchen or living room. (I don't recommend the bathroom; even if it survives the shower steam, you're likely to get shampoo in your eye trying to read The Onion and shower at the same time.) In this spirit, I chose a compact case and a flat-panel display to minimize the footprint. I also utilized a wireless RF keyboard and mouse, as RF doesn't require line of sight like infrared.

I also included both a modem and two Ethernet cards. The two cards mean more sophisticated users can configure this appliance as a router/firewall for their home network. It's a nice extra feature to have, and it only costs a few bucks more.



Many commercial Web access devices boot from memory, giving the device instant-on capabilities. I went the more traditional route and added a hard drive. This means no instant on, but it also means greater storage capacity. With a hard drive, this machine isn't just for e-mail; it can also store and play back digital music. This also explains the included CD-ROM drive.

I decided to go with the download edition of Linux Mandrake 8.1 for stability. Linux has a notoriously sharp learning curve, but I think it works well when all you really care about is surfing the Web and sending e-mail. With graphical environments such as GNOME and KDE, Web browsers and e-mail clients are just as easy to launch in Linux as they are in Windows. Anyone who can't launch Netscape in KDE is just an opposable digit away from forwarding moronic hoaxes to everyone they know, and we're better off without them online.

Mandrake provides a number of graphical front-ends that let you easily configure your connection, set up Internet connection sharing, and construct a basic firewall. Mandrake also includes an automatic login feature so users don't have to log in when they boot up Linux. Included with Mandrake are several Web browsers (Netscape, Mozilla, Galeon, and Konqueror). Other Web access devices include one of the best newsreaders I've used on any platform, Pan, the e-mail client KMail, and several instant-messaging applications.

Additional software from the Internet completed the package by adding support for Java and Macromedia Flash Web sites as well as streaming audio and video. One final application provided a personal information management and e-mail package similar to Microsoft Outlook.

Despite its Linux base, this system is an effective and flexible Web access device for anyone with a modicum of computer knowledge. I wouldn't mind this little device sitting in the corner of my living room.

Component	Model	Price
Case	Enlight EN-7180AK micro-ATX**	$34.60
Motherboard	Biostar M7VKS (Micro-ATX Integrated Video & Audio)*	$55
Processor	AMD Duron 850MHz*	$46
Memory	Kingston Tech. PC100 128MB****	$14.99 (after $15 rebate)
Hard Drive	Western Digital 20GB Hard Drive*	$69
Video Card	n/a	n/a
Sound card	n/a	n/a
Modem	3Com 56K V.90 Internal PCI Fax Modem (Hardware based)*	$49
Network Card	D-Link 10/100 DFE530TXNetgear 10/100 FA311*	$25.50
CD-ROM	LG Electronics CRD-8520B 52X EIDE*	$29
Diskette	n/a	n/a
Speakers	MLI SP190 18W Speakers*	$8
Mouse	n/a	n/a
Keyboard	Logitech Cordless Mouse/Keyboard*	$44.50
Monitor	Gvision USA 14.1-inch LCD TFT***	$299.97
Software	Linux Mandrake Download Edition; Assorted Downloads	n/a
Miscellaneous	AMD Duron/Thunderbird CPU Fan*	$6
	Thermal Compound*	$3.95
Subtotal		$685.51
Tax		$20.80
Shipping		$37.99
TOTAL		**$744.30**

Purchased From
*Multiwave Direct (www.mwave.com)
**PROVANTAGE (www.provantage.com)
***CompUSA
****Best Buy

Michael

What's the difference between an all-purpose home PC and a Web-surfing PC? About $500. This month, I was given the task of building an e-mail and surfing machine for the grand sum of $750, *including* monitor. Yikes! When I shop, the last thing I want to think about is a budget, so I knew this assignment would be trouble.

I realized early on that I'd have to make some sacrifices to build this PC under budget. No speakers for me, no cable modem, and definitely no CD-RW drive. I opted for an AMD processor because they cost about as much as two tanks of gas. I found one online for $38.

In retrospect, I should have bought the motherboard online, as well, and saved a few more dollars. The motherboard I bought didn't have an integrated modem or video chip, so I bought an ATI Xpert video card and a $25 modem that just happened to have a $10 mail-in rebate. I also found a Microsoft WheelMouse Optical mouse with a $10 rebate, bringing the price down to a mere $14, so I sprang for it. A stick of 128MB PC133MHz memory cost me $14.

I was quickly running out of cash, so I decided it was time to head to a used PC store. I found a decent used NEC monitor for $99, and I had to shell out $150 for a copy of Win98SE. All that was left was the hard drive. The $65 3.2GB hard drive I bought at the used PC store put me a bit over budget, and that's when I really started wishing I had just $20 more. Then I could have bought a 20GB or even 30GB hard drive. Really, you don't need a large hard drive for a simple Web surfing machine, but spending $20 more for an extra 14GB of hard drive space would obviously be a better deal.

I gave my PC one last checkup about an hour before the Bossman was to take it for a test drive. But when I rebooted the system, it didn't start up. The screen was blank, the keyboard LEDs started blinking menacingly, and there was no hard drive activity whatsoever. Clearly, this was a bad sign. The system couldn't run its POST routine, which means the computer couldn't run at all.

I tried reviving the system by uninstalling and reinstalling various pieces of hardware, to no avail. I had built a $750 end table. I suspected a faulty motherboard or possibly a bad BIOS chip, although, I've been informed that the five quarts of motor oil I added to the system may have contributed to its demise. (AMD motherboards don't use 10-W40?)

Component	Model	Price
Case	Titanan ATX***	$49.99
Motherboard	MSI K7T Turbo***	$129.99
Processor	900MHz AMD Duron****	$38
Memory	Reptron Electronics 128MB PC133MHz*	$14.99
Hard Drive	Seagate 3.2GB***	$64.99
Video Card	ATI Xpert*	$49.99
Sound Card	n/a	n/a
Modem	Digicon Systems*	$15.50
Network Card	n/a	n/a
CD-ROM	Acer 56X CD-ROM*	$39.99
Diskette	1.44MB***	$14.99
Speakers	n/a	n/a
Mouse	Microsoft Wheelmouse Optical**	$14.99
Keyboard	Belkin**	$11.99
Monitor	15-inch NEC***	$99.99
Software	Microsoft Windows 98SE***	$149.99
Miscellaneous	Solutions Series cooling fan*	$14.99
Subtotal		$710.38
Tax		$42.08
Shipping		$6.95
TOTAL		**$759.41**

Purchased From:
*Best Buy
**Office Depot
***Computer Renaissance
****NewEgg.com

And The Winner Is . . .

It seems the Editor Prime (Pub Editor Samit to you just tuning in) has grown tired of the feeble competition the CPU scribes were giving him. Hence, he tucked his perfect 3-0 PC Challenge record between his legs and let the fellas scrap amongst themselves this month for his vacated throne. I'm sure we haven't seen the last of the Insidious One, but in the meantime, he's left me here to stumble through a land of Web access machines featuring Linux, Windows 98, Duron processors, and oh yeah, Yoo-Hoo and Ho Hos. Yeah, you read that last part right. Michael's budgetary skills may be whack (dude's 10 bucks over), but my man did have the smarts to dump some tasty drinks and eats on my desk. I think he was hoping I'd succumb to a chocolate-induced coma and confuse Chad's entry for his because Sweet's rig ain't so sweet. To be precise, the thing doesn't work. As in blank screen. As in "Where's my Fark.com, big man?" Being a tensky over the $750 line is one thing, and the Ho Hos did hit the spot, but even I will play the chump for only so long. I'm thinking Chad would have won anyway. He gave me speakers, network cards, and a hard drive that didn't scream "puny." So Chad, you win by default, but throw that Linux stuff at me again, and we'll have to talk. I'm OK jumping on the Web via a Linux boot, but it took years off my life getting my kids to skip over to NickJr.com the Windows way without help, and I'm not about to mess them up. *—Blaine "Bossman" Flamig, content editor*

Swappin' Parts

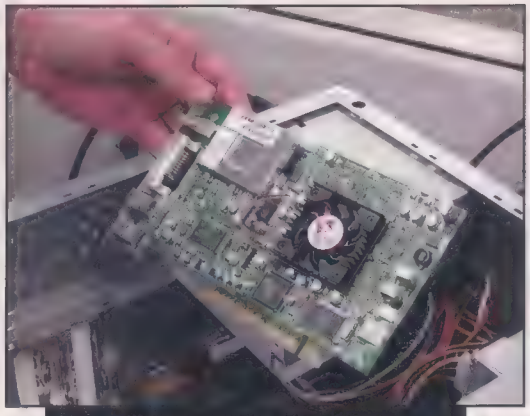
There's A Transformation Taking Place

Each month in "Swappin' Parts," a Computer Power User writer upgrades one out-of-date component in our test machine, MERLE (Mediocre Electronic Refurbished Low-end Equipment). When we're finished, we will have transformed MERLE from a silicon trash can into a powerful system we'd be proud to put into our own homes. To date, we've upgraded MERLE's CPU, sound card, speakers, and memory.

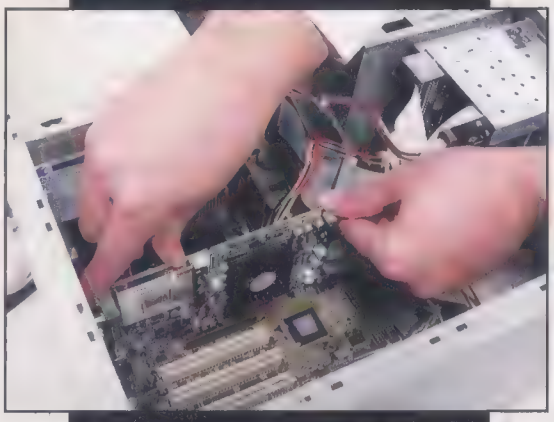
The improvements we've made so far to MERLE have certainly made him a better PC, but this month's upgrade will be the best one yet. We're giving MERLE a powerful new video card to replace the ancient vacuum tubes he's been using to display graphics.

Graphics cards are one of our favorite peripherals, so we've been looking forward to this month's upgrade. Although expensive, a graphics card upgrade is one of the best improvements you can make to a PC, especially if you're a gamer. A good graphics card not only accelerates 3-D games at break-neck frame rates, it makes the games look great, too. Some video cards also have features that make them even more useful, such as a built-in TV tuner and the ability to capture video.

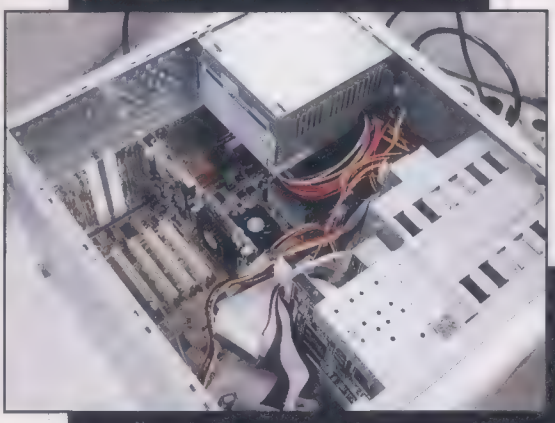
There are several brands of video cards on the market. Power users often opt for a card that uses an NVIDIA GeForce processor or an ATI card that uses a Radeon video chip. We chose the All-In-Wonder Radeon 8500DV from ATI. Sure, we wouldn't mind installing a GeForce3 Ti 500 in MERLE, and we're sure he wouldn't mind either. But the All-In-Wonder Radeon 8500DV is nearly as powerful as a GeForce3 Ti 500 and has a few tricks up its sleeve that you won't find in most GeForce3 video cards.



Installing a new video card in MERLE was easy. In fact, it would probably take you more time to make a sandwich.



We had to rock MERLE's new Radeon back and forth a bit before it would sit properly in the AGP slot



MERLE was a hurtin' machine when it came to playing games on his old 8MB PCI video card. The beefed-up Radeon gives MERLE new video life.

ATI's new Radeon 8500 GPU powers the All-In-Wonder Radeon 8500DV, which has 64MB of DDR-SDRAM. The card has a maximum resolution of 2,048 x 1,536 at a refresh rate of 85Hz with a maximum refresh rate of 200Hz. The video card has a pair of IEEE 1394 ports so you can capture video from a digital camcorder. You can also capture video from an analog source such as a VCR. Furthermore, the Radeon 8500DV has a TV tuner and remote control so you can watch TV on your PC from your couch. The card supports flat-panel displays and has dual-display support, so you can connect a monitor and TV to the card. The Radeon 8500DV costs $400, which is about $50 more than most GeForce3 Ti 500 video cards. The GeForce3 Ti 500 cards don't have the All-In-Wonder Radeon 8500DV's features, which we think are worth the extra cash.

Installation

You'll probably find that deciding which video card to buy is more difficult than actually installing it. Upgrading a PC's video card is easy. It took us about as long to install the Radeon card as it will take you to finish reading the rest of this article, assuming you don't run to the bathroom or make a sandwich between now and then.

So MERLE wouldn't get too confused from when we installed the

Radeon 8500DV to when we installed the card's drivers, we first had to change MERLE's video card driver setting from "flaccid 8MB wheezer" to "standard PCI graphics adapter." There are a couple of ways to do this. The steps you follow may be different than ours depending on the video card you use. We right-clicked the Desktop and clicked Properties, which opens the Display Properties dialog box. We clicked the Settings tab and then the Advanced button. Next, we clicked the Adapter tab and then the Change button, which started the Update Device Driver Wizard. We selected the Display A List Of All Drivers In A Specific Location option, clicked the Next button, and clicked the Show All Hardware radio button. We scrolled to the top of the Manufacturers list box and clicked (Standard Display Types). We clicked Standard PCI Graphics Adapter in the Models list and clicked the Next button, after which the PCI driver was installed.

We were now ready to crack MERLE open and begin the hardware phase of the upgrade. We shut down MERLE and opened the case, making a point to ground ourselves. We disconnected the display from the current video card, yanked the card out of its AGP slot, and flung it at a nosy Samit (CPU's Editor Prime), who was dribbling near our work area when he caught a glimpse of the Radeon 8500DV's box in our office.

We gleefully unwrapped the Radeon 8500DV, which was loaded to the gills with various hardware and software odds and ends, including a rather cumbersome external cord that contained various inputs and outputs for analog devices. We popped the card into the AGP slot rather easily, although we had to rock it back and forth a little to drive it home.

Before we could connect the monitor to the video card, we had to connect a DVI-to-VGA converter to the monitor's connector. The Radeon 8500DV only has a DVI port, which is a bit unusual. ATI provides a DVI-to-VGA adapter, so the DVI-only connection is simply a curiosity and not an obstacle, provided your dog doesn't run off with the adapter. We connected the monitor to the video card and replaced MERLE's case. Finally, we attached the cable with the various inputs and outputs to the appropriate port on the video card. We would have liked to connect a DV camcorder, VCR, and various other audio and video components to MERLE, but we couldn't find a way to sneak into CPU editor Blaine's home and "borrow" some.

We restarted MERLE and popped in the CD-ROM containing the Radeon 8500DV's drivers. The New Hardware Found Wizard took it from there, installing the drivers without a hitch. We restarted MERLE, installed the rest of the ATI software, and restarted the PC again. We didn't encounter any problems installing either the hardware or software, and MERLE seemed to glow more fiercely than ever with his new video power.

MERLE is finally powerful enough to run the 3DMark2001 benchmark, which he couldn't do before using his old wimpy 8MB video card.

This Is A Test

After making our upgrades, we run a couple of benchmarks on MERLE to see the effect of the video card on him. So far, we haven't seen dramatic differences in performance after our previous upgrades. However, the video card upgrade clearly improved MERLE's performance. In fact, MERLE is finally powerful enough to run the 3DMark2001 benchmark, which he couldn't do before using his old wimpy 8MB video card. The 3DMark2001 benchmark from MadOnion measures the overall 3-D capabilities of a PC by running various graphics-intensive 3-D scenarios and measuring how well the system handles them. We plan on continuing to run 3DMark2001 after future upgrades.

Last month, we installed a fistful of additional RAM in MERLE. After that upgrade his Overall SYSmark2001 score was 75, with an Internet Content Creation score of 82 and an Office Productivity score of 69. The overall Video2000 Video Mark score was 1,533, with a Performance score of 696 and a Features score of only 359.

We ran both of these benchmarks after installing the Radeon 8500DV. Not surprisingly, the SYSmark2001 score didn't change much. Even an 8MB video card runs 2-D programs fairly well, and the latest 3-D video cards are geared toward improving 3-D graphics (obviously) rather than 2-D graphics. MERLE's new SYSmark2001 Overall score was 75, just as it was before the upgrade. The Internet Content Creation score was 82, and the Office Productivity score was 68.

We did see significant improvements in the Video2000 scores. The overall Video Mark score jumped to 2,218, with the Performance score increasing to 804. The Features score jumped to 659, nearly twice the Features score MERLE was able to muster before we upgraded his video card. Finally, we ran the 3DMark2001 benchmark; the overall score was a very respectable 2,289.

Final Thoughts

The benchmark tests we ran on MERLE after upgrading the video card prove he's ready to rock and roll with the latest video games, but what the numbers can't show is how good MERLE's graphics look. We couldn't even run most new video games on MERLE before we installed the Radeon 8500DV. Now that he has a real video card, we can run any game available on MERLE. We'll also be able to watch TV in the office, and if we happen to find some incriminating video of Samit, we'll be able to capture it, edit it, and post it to *Computer Power User's* Web site for all the world to see. CPU

by Michael Sweet

X-ray Vision: G.SHDSL

Forget about too many cooks spoiling the broth. When it comes to cooking up the G.SHDSL standard, the more DSL flavors, the better.

G.SHDSL is a recently developed standard for delivering high-speed data over a basic telephone line. G.SHDSL is short for G.symmetric single-pair, high-bit-rate DSL. The ITU (International Telecommunications Union) ratified the G.SHDSL standard, also known as G.991.2, in February 2001 to serve as the next generation of DSL technology. Development of the G.SHDSL standard marked the first time the ITU developed a DSL technology from scratch.

G.SHDSL takes advantage of the key components found in other DSL technologies, including ADSL (Asymmetric DSL) and SDSL (Symmetric DSL), to provide the best international standard available. G.SHDSL also takes advantage of past research into various types of DSL, giving it the best possible design. For example, G.SHDSL can offer multiple phone connections along with the broadband channel. It will be able to transport videoconferencing signals, as well as T1, E1, ISDN, ATM, and IP signals.

G.SHDSL will serve as the new international standard for Symmetric DSL, giving businesses that need high-speed data transmissions for uploading and downloading a viable option. Businesses could use G.SHDSL for a variety of purposes, including Web hosting, remote access to the network, WAN connections, and a combination of voice and data channels. In each of these instances, high upload speeds are vital.

The Origin Of G.SHDSL

Most people think G.SHDSL will eventually replace several types of broadband technologies around the world. Ironically, G.SHDSL borrowed

many of its key features from these same technologies.

ADSL. The most common form of Asymmetric DSL, called ADSL Lite, offers high download speeds (usually about 1.5Mbps) and slower upload speeds (usually about 384Kbps). ADSL Lite's actual speeds depend on a variety of factors, including distance from the telephone company's central office. G.SHDSL can usually surpass ADSL Lite's top download speeds while boosting upload speeds. Other forms of ADSL can achieve download speeds up to 9Mbps and upload speeds up to 1.5Mbps, but they aren't currently popular because of various limitations on where and how they are available.

E1. Offers data transmissions at 2Mbps but has severe limitations on the distance over which it can operate. G.SHDSL offers slightly better speeds with reliability over a greater distance.

HDSL. Offers symmetric data transmissions as fast as 1.544Mbps with few distance limitations. Uses 2B1Q line code, which is an older technology. G.SHDSL borrowed the long-distance capabilities of HDSL while offering improved speeds.

HDSL2. Offers symmetric data transmissions as fast as 1.544Mbps with few distance limitations. Uses TC PAM line code, which is a newer technology. G.SHDSL borrowed the long-distance capabilities and the TC PAM line code of HDSL2 while offering improved speeds.

ISDN/IDSL. Offers symmetrical data transmissions at 144Kbps. It's a popular, reliable broadband option, but it can't match G.SHDSL's data transmission rates.

SDSL. Offers symmetric data transmissions at around 2Mbps, but a standard never existed for this technology. It's probably the most similar type of DSL to G.SHDSL, though. With its standardization, G.SHDSL will enjoy greater widespread use at lower prices than SDSL.

T1. Offers data transmissions at 1.544Mbps but has severe limitations on the distance over which it can operate. G.SHDSL offers better speeds with reliability over a greater distance.

The Case For G.SHDSL

Experts say G.SHDSL most resembles HDSL and SDSL, borrowing their best traits and making G.SHDSL a highly desirable standard.

G.SHDSL can operate at data transfer speeds between 192Kbps and 2.312Mbps for a single-pair (two-wire) operation and between 384Kbps and 4.624Mbps for a two-pair (four-wire) operation. These varying speeds will let service providers create

Graphics & Design: Fred Schneider & Ned Day

different levels of service with different prices to meet the needs of the most customers possible.

G.SHDSL can operate over distances greater than 20,000 feet from the CO (central office), which may be its greatest advantage over other flavors of Symmetrical DSL. In comparison, SDSL operates at distances as far as 18,000 feet from the CO.

The development of the G.SHDSL standard should prove significant in the expansion of the Symmetric DSL market in several areas, including voice transmissions, data transmissions, and Internet access. The ITU's setting of the international standard should help development of G.SHDSL by fostering competition among DSL providers and encouraging equipment manufacturers to create hardware for a single standard. With other forms of DSL, hardware manufacturers must deal with multiple standards around the world, which makes the development process more expensive than it is with G.SHDSL.

The Ultimate DSL

By taking the best features of other types of DSL, G.SHDSL provides significant speed and performance improvements over previous versions of DSL. Experts predict most users will see a 35% to 45% improvement in overall speed for data transfers and a 15% to 20% improvement in the operational range distance using G.SHDSL vs. SDSL and HDSL.

G.SHDSL, because of its digital nature, also enjoys an advantage over ADSL. By using digital transmission technology, G.SHDSL can use the lower band of frequencies to achieve high performance, all while maintaining the ability to transmit voice communications.

G.SHDSL makes use of TC PAM (Trellis Coded Pulse Amplitude Modulation) as its line code. By using TC PAM, G.SHDSL offers a high level of digital performance, even if the line experiences a lot of interference. Because it's resistant to interference,

Data Transmission Speeds

G.SHDSL offers symmetrical speeds (the same for upstream and downstream) like ISDN, and it offers high speeds for data transmission, much like ADSL Lite and cable Internet access. G.SHDSL also offers steady performance speeds, unlike ADSL Lite and cable, where the data transmission speeds can vary greatly depending on several factors, including line noise and the number of users.

* Other, less common forms of ADSL can achieve higher downstream and upstream speeds, but the availability of such ADSL services is limited to certain locales.

** Expected speed under favorable conditions; actual speeds may be higher under ideal conditions or much slower during peak usage times.

TC PAM lets G.SHDSL work over greater distances without a major performance loss, like some other types of Symmetric DSL that use the 2B1Q line code often suffer.

Gee, Excitement Abounds

The excitement in the industry about the potential for G.SHDSL seems particularly high. Top companies, including Cisco, Adtran, and Infineon, have expressed solid support for G.SHDSL. The quick adoption of the G.SHDSL standard—less than three years from proposal to the ITU's adoption—shows widespread support and bodes well for the standard's future.

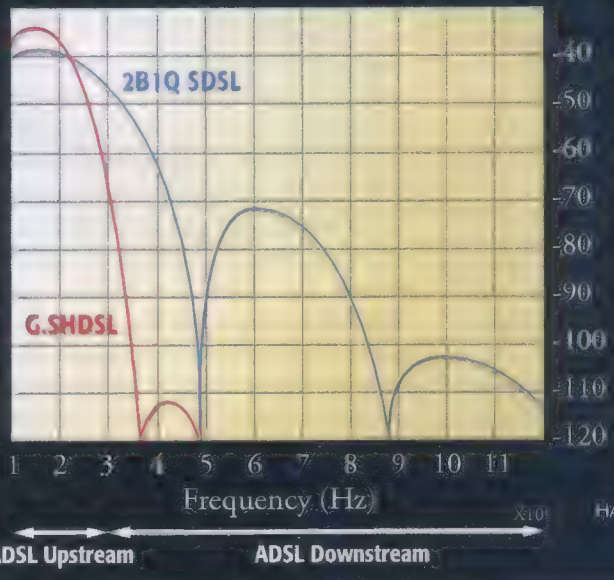
G.SHDSL will probably replace many types of older DSL and other broadband technologies aimed at businesses, including HDSL, SDSL, ISDN, and T1. ADSL, meanwhile, probably will continue to work best for consumers by offering higher data transmission rates for downloading than for uploading. ADSL works well for Web surfing, but its slower uploading speed doesn't work well for those needing to upload large files. Business users needing fast uploading capabilities are more likely to turn to G.SHDSL. It also offers steady transmission speeds, while ADSL's transmission speeds can vary depending on the amount of noise on the line and on distance from the CO. While G.SHDSL supporters admit G.SHDSL probably will be more popular among small businesses than consumers, some types of consumers—depending on their Internet needs—may turn to G.SHDSL. For example, consumers who need high upload speeds for real-time gaming, run multiple phone lines, or live too far away from a CO to use ADSL might want to look at G.SHDSL.

Now if only the standard had an easier name to remember. After all, G.SHDSL is a little tough on the tongue. If the early hype for G.SHDSL proves true, though, most in the industry will naturally shorten it to DSL because it will become synonymous with the technology. CPU

by Kyle Schurman

Less Noise, Better Compatibility

Compared to SDSL, G.SHDSL doesn't interfere much with ADSL. The numbers on the right indicate the amount of energy noise each type of DSL generates when operating at a data rate of 784Kbps. Readings closer to zero indicate greater noise, which interferes with ADSL.



G.SHDSL operates in a smaller frequency range than SDSL and generates less noise in the ADSL downstream frequency spectrum, making it more compatible with ADSL than SDSL.

Source: University of New Hampshire InterOperability Labs

DSL Subscribers Worldwide

According to these estimates from Adtran, the number of DSL subscribers worldwide has increased each year since 2001.

Source: Adtran

U.S. Business DSL Lines

These numbers reflect the estimated number of business DSL lines installed in the United States.

Source: The Yankee Group and Adtran

TeraHertz

Intel's Transistor Breakthrough

If there's one thing developers and researchers in the technology industry have learned over the past several decades, it's that no new product will be a slam-dunk success. After all, it wasn't that long ago that many experts thought we'd all be using Newton PDAs with voice and handwriting recognition software by the start of the 21st century. My Newton is in my flying car next to the talking "Hal" computer we were all supposed to have by now, too.

Although nearly every new technology has had its share of detractors, forecasting the success of some technologies from well-known companies isn't as difficult as it is with breakthroughs from unknowns. The impending success of Windows 95 from Microsoft and of digital cameras from Canon was not overly difficult to predict because of the track record of successes those companies have enjoyed. Those new products built on the fields of expertise those companies already possessed: Microsoft in graphical operating systems and Canon in film photography.

Based on the track record of another industry giant, Intel, we wouldn't bet against the success of Intel's newest structure for transistors (which are the tiny switches that make up a microprocessor). Intel has labeled its new technology TeraHertz transistors, and the microprocessor manufacturing king expects TeraHertz transistors to revolutionize the world of microprocessors.

Tossing Transistors A Life Preserver

Intel predicts TeraHertz transistors will give transistors and microprocessors massive improvements in several areas of performance, including higher transistor speeds, lower power usage, and reduced heat generation. In fact, Intel is counting on TeraHertz transistors to allow the corporation to continue meeting the demands of Moore's Law, a prediction that the number of transistors on a chip will double every 18 to 24 months, thanks to technological improvements.

Intel researchers have upheld Moore's Law for more than 30 years, but as Intel has shrunk the size of transistors while increasing their speed in the past few decades, researchers in the company have known that potential problems inside the chip were growing and that they would need to make some major technological improvements to transistors and chips to keep Moore's Law alive beyond the next few years.

Improvements in transistor speed and size were yielding continuing problems with heat generation and power consumption. Without a major technological breakthrough to avoid them, such growing problems would eventually negate and render moot any improvements in transistors. Without an alteration in the current pace of improvements, some industry experts predicted transistor heat would eventually cause a microprocessor meltdown.

Instead of tackling the heat problem alone, though, Intel designers set goals for a new transistor technology that could improve the overall performance of the processor—somewhere around 10 times the speed of today's processors—while squeezing about 25 times as many transistors on the chip with no increase in power consumption and no additional heat generation, according to one Intel executive. That sounds easy enough, right? Well, probably not until Intel's announcement of the TeraHertz transistor technology late in 2001.

Heating Up

Transistors are microscopic switches that reside on the microprocessor. The switches process the 0s and 1s that make up computer binary language. The 0s and 1s consist of electrical pulses that zoom through the transistors. Current microprocessors host tens of millions of transistors, even though the microprocessors are no larger than a thumbnail.

The most common type of transistor in use today is a CMOS (complementary metal-oxide semiconductor) transistor. Manufacturers build the CMOS transistor on a wafer of silicon, which conducts electricity. The CMOS transistor contains a switch that either blocks the flow of electrical current or allows the current

TeraHertz transistors will improve performance by lowering the amount of heat transistors generate while in operation.

to pass through. A transistor with a flowing current is considered on and is represented by the number 1 in the binary language. With the current blocked, the transistor is considered off and is a 0 in the binary language.

The current moves from one side of the transistor, which contains the source channel, to the other side, which contains the drain channel. To allow the flow of electrical current (creating a 1), a gate in the transistor opens. When the gate closes, the flow from the source to the drain halts, resulting in the transistor turning off (creating a 0). The gate almost acts like a drawbridge, going up and down to change the flow of the current from the source to the drain. (You'll often see the source, gate, and drain referred to as the transistor's three terminals.) The source and drain areas consist of silicon; the material used to manufacture the gate is called polysilicon.

The process of the transistors changing between 1s and 0s is what lets the microprocessor manipulate data and perform calculations. The millions of transistors contained on a chip are connected to each other by a series of extremely thin wires called interconnects.

Transistor developers in the past few decades have been able to improve the speed with which a microprocessor works by shrinking the transistors themselves and increasing the number of transistors stored on the microprocessor. As the transistors shrink, however, they leak more current (or lose stray electricity). As the leakage increases, the amount of electricity the transistors need to run properly increases, too. Plus, faster transistors generate larger amounts of heat as the electrical pulses surge through the transistors. As the number of transistors increase, each of these problems multiplies.

Recent Intel transistor developments have yielded a 15-nanometer transistor that will lead to microprocessors with hundreds of millions or even 1 billion transistors before 2010. Intel engineers know that approaching 1 billion transistors on a single chip probably isn't possible under current transistor technology, though, because of the problems with heat generation, current leakage, and power consumption. Without design changes, the chips and transistors would eventually generate too much heat for use in a desktop computer or a server.

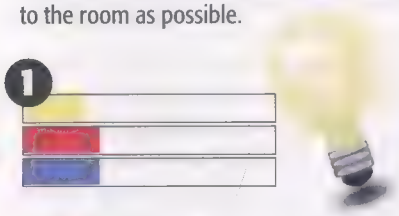
That's One Cool Technology

TeraHertz transistors can solve these problems with several design improvements, including better focusing the electrical current where it's needed. With a better concentration of the electrical current, the transistors generate far less heat and leak less current, which leads to lower power consumption.

To achieve the improvements Intel desired, it had to alter the existing transistor design. Intel came up with two key technological improvements: high k gate dielectric, which is a new material for a transistor's gate dielectric, and a depleted

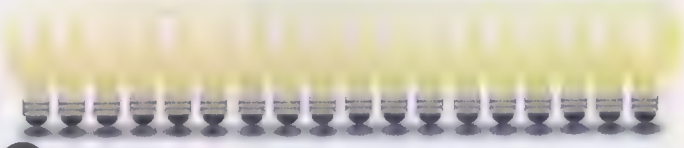
The Need For TeraHertz

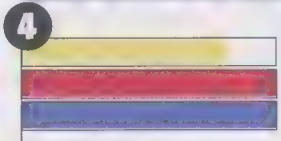
These light bulbs represent some of the inherent problems with transistors. The purpose of the bulbs is to provide as much light to the room as possible.



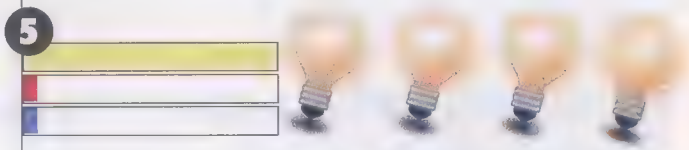
1. In the early days of developing the room's light, your technological know-how only lets you fit one light bulb in the room.

2. and 3. With technological improvements, you can squeeze more and smaller light bulbs into the room, generating more light.

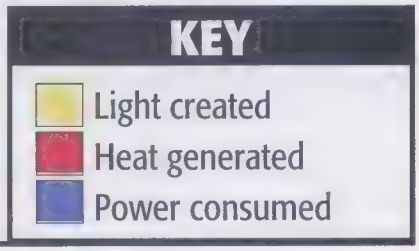




4. More lightbulbs means more heat dissipation and electricity usage, but these elements are still manageable. Eventually you'll reach a point where adding more and smaller light bulbs will generate too much heat and electricity usage.



5. To add more light to the room, you'll need to develop a new light bulb technology that can generate far more light than traditional means while using far less electricity and generating far less heat, which is Intel's hope for TeraHertz transistor technology.



Inside The TeraHertz Numbers

Here are some facts and figures related to Intel's TeraHertz transistor:

- Intel expects the TeraHertz transistor will be able to switch on and off at least 1 trillion times per second.
- A person would need more than 15,000 years to turn on and off a light switch 1 trillion times.
- To continue following Moore's Law, Intel researchers estimate they'll need to create a 1 billion-transistor chip by around 2007. The Pentium 4 chip, introduced in 2000, contains 42 million transistors.
- Intel developers say the first processors based on TeraHertz transistors will probably appear after 2005 with 1 billion transistors running at 1 trillion cycles per second.
- Don't let the terminology fool you: TeraHertz is Intel's name for its new transistor technology, while terahertz (THz) is equal to 1 trillion hertz or 1,000 gigahertz (GHz).

substrate transistor, which is a new type of transistor architecture.

High k gate dielectric. This isn't the catchiest name for a new technological development, but Intel's use of high k gate dielectric as a material for the TeraHertz transistors provides some significant advantages over what's now available; today's transistors use a silicon dioxide material for the gate dielectric.

First, a little background: The material used to separate the gate from a transistor's active region, called the gate dielectric, is extremely thin, less than 1 nanometer, or about three atomic layers thick. In chip technology now available, the gate dielectric is made of silicon dioxide and is the source of significant current leakage. This thin gate dielectric is too thin to act as a good insulator and block the flow of current between the source and drain when the transistor is turned off (called off-state leakage). This problem increases the amount of power the transistor and chip need, which hurts the overall performance of battery-operated devices using the chips.

As a fix, Intel has developed a new material, high k gate dielectric, to use as the separator. High k is an engineering term that describes the capability of a material to conduct electricity. In a high k material, electrical signals move slowly because the materials are more resistant. In low k materials, electrical signals travel quickly through the material. Intel estimates high k dielectric will reduce leakage by more than 10,000 times over what's available with silicon dioxide, reducing heat and improving power consumption and overall performance.

Developers use a technique called atomic layer deposition to create the high k gate dielectric material, which occurs in layers one molecule thick. This new material is physically thicker than silicon dioxide, which lets it cut leakage significantly. High k gate dielectric material still retains the desired electrical properties for the gate dielectric, though. Intel continues experimenting with several different compounds to find the perfect type of material for use in transistors. Zirconium oxide is one type of material under consideration.

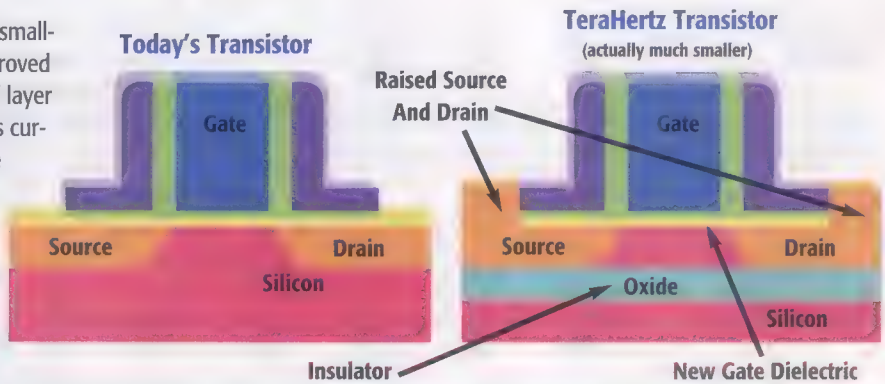
Depleted substrate transistor. The depleted substrate transistor is a new type of CMOS device designed for TeraHertz transistors. Developers for the depleted substrate transistor start with a layer of silicon and an embedded layer of insulation, upon which they place an extremely thin layer of silicon. Developers then build the transistor on top of the thin layer of silicon.

While the thin silicon layer is similar to other SOI (silicon-on-insulator) devices, Intel says its thin silicon layer offers one major difference: It's designed to create maximum drive currents whenever the transistor switches on, thereby letting the transistor turn on and off more quickly. The thin silicon layer in Intel's TeraHertz transistor design also uses low resistance contacts, which lets the transistors use very little power.

The embedded layer of insulation is key, too. It helps minimize current leakage whenever the transistor is turned off. Even when the transistor is off, some current flows between the source and the drain areas of the transistor. This

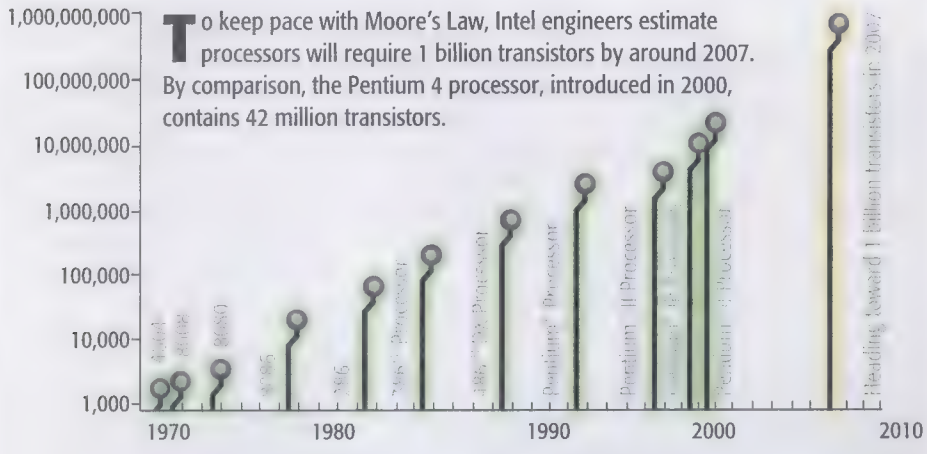
Old vs. New: How TeraHertz Stacks Up

Intel's TeraHertz transistor (right) will be much smaller than today's transistors while providing improved performance in a variety of areas. The embedded layer of insulation in the TeraHertz transistor minimizes current leakage. The new high k gate dielectric in the TeraHertz transistor improves on today's gate dielectric technology by reducing leakage and by lowering heat generation. The raised source and drain areas will help reduce the power needs for the TeraHertz transistor compared to the needs of today's transistors.



SOURCE: INTEL

Keeping Up With Moore's Law In The Future



unwanted current flow can cause a variety of problems. The embedded layer of insulation will work with the high k gate dielectric to effectively cut off this flow of current between the source and drain areas unless the transistor is on. Intel estimates the depleted substrate transistor will have 100 times less current leakage than SOI transistor designs now in use.

However, solving the leakage problem caused another problem: the transistor now required a higher voltage to send a current flow between the source and drain to meet the added resistance. Think of it like a water pipe that has a wide diameter on both ends (the connectors between the transistors) and a narrower diameter in the middle (the connection between source and drain areas). It takes far more power pushing from the wide ends to squeeze the water through the narrow portion of the pipe. Intel fixed this problem by making the source and drain areas thicker, thereby reducing by about 30% the amount of voltage required to send the current flow. Continuing with our pipe example, by widening the middle of the pipe (containing the source and drain areas), that portion of the pipe offers less resistance, and it takes less pressure to force the water through that area of the pipe.

Adding the embedded layer of insulation resulted in one additional benefit: Because the area above the insulation is extremely thin, stray radioactive particles in the air that sometimes lodge inside the transistors and cause problems no longer have room to fit. (Smaller transistors seem to be more susceptible to inadvertently collecting such particles.) The extremely thin area no longer will be able to collect charge from the current flow, either, which should result in increased reliability for TeraHertz transistors over today's transistors.

Where TeraHertz Delivers

TeraHertz transistors could make possible several technologies currently waiting for extremely fast chips, such as real-time voice recognition, real-time face recognition, voice-enabled computing, and smaller handheld computing devices that use batteries more efficiently. Because of inefficiencies in today's transistors, these technologies aren't yet practical. Real-time face recognition, for example, needs much faster processors than are currently available; smaller handheld devices need better power management from the processors. TeraHertz transistors should help meet the needs of these technologies.

With the development of TeraHertz transistor technology, Intel researchers now expect Moore's Law to remain alive until at least 2010. Don't expect to begin purchasing Intel-brand chips featuring TeraHertz transistors tomorrow, though. As with any new technology, several rounds of testing and additional research are needed before Intel can begin mass-producing the TeraHertz transistors. Intel estimates it will begin incorporating TeraHertz transistor technology into its microprocessor product lines around 2005. In other words, we'll have to wait a few years to see whether the initial excitement over this new technology was actually justified. Considering Intel's more than 30 years as an industry leader, though, you have to like the odds for TeraHertz transistors being a big success . . . no matter how little they are. CPU

by Kyle Schurman

What The Critics Say About TeraHertz

Not everyone shares Intel's enthusiasm for its TeraHertz transistors. Critics cite these potential drawbacks:

- Intel's high k gate dielectric materials may work well for a while, but, as the chip manufacturing process shrinks to less than 0.10 microns, high k gate dielectric will be too thin, causing current leakage.
- It's unknown how high k gate dielectric material will stand up to harsh elements, such as high temperatures, over the long haul.
- Intel's claims that its insulation layer will prevent the build-up of unwanted charge within the transistor might not work as well as Intel hopes.
- The demands on silicon wafer manufacturers for extremely thin layers might not be possible to meet.
- Intel's use of a form of SOI (silicon-on-insulator) technology is a 180-degree turn for the company; it has previously criticized other manufacturers for incorporating SOI in their chips. Intel responds to this criticism by saying its version of SOI is more technologically advanced than other forms of SOI currently available.

room to burn

VINYL
DIGITAL VIDEO
DATA BACKUP
ORIGINAL MUSIC
DIGITAL PHOTO
MP3

Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit roxio.com to find out how. Mac® users check out Roxio's Toast® 5.

Now Windows® XP compatible.

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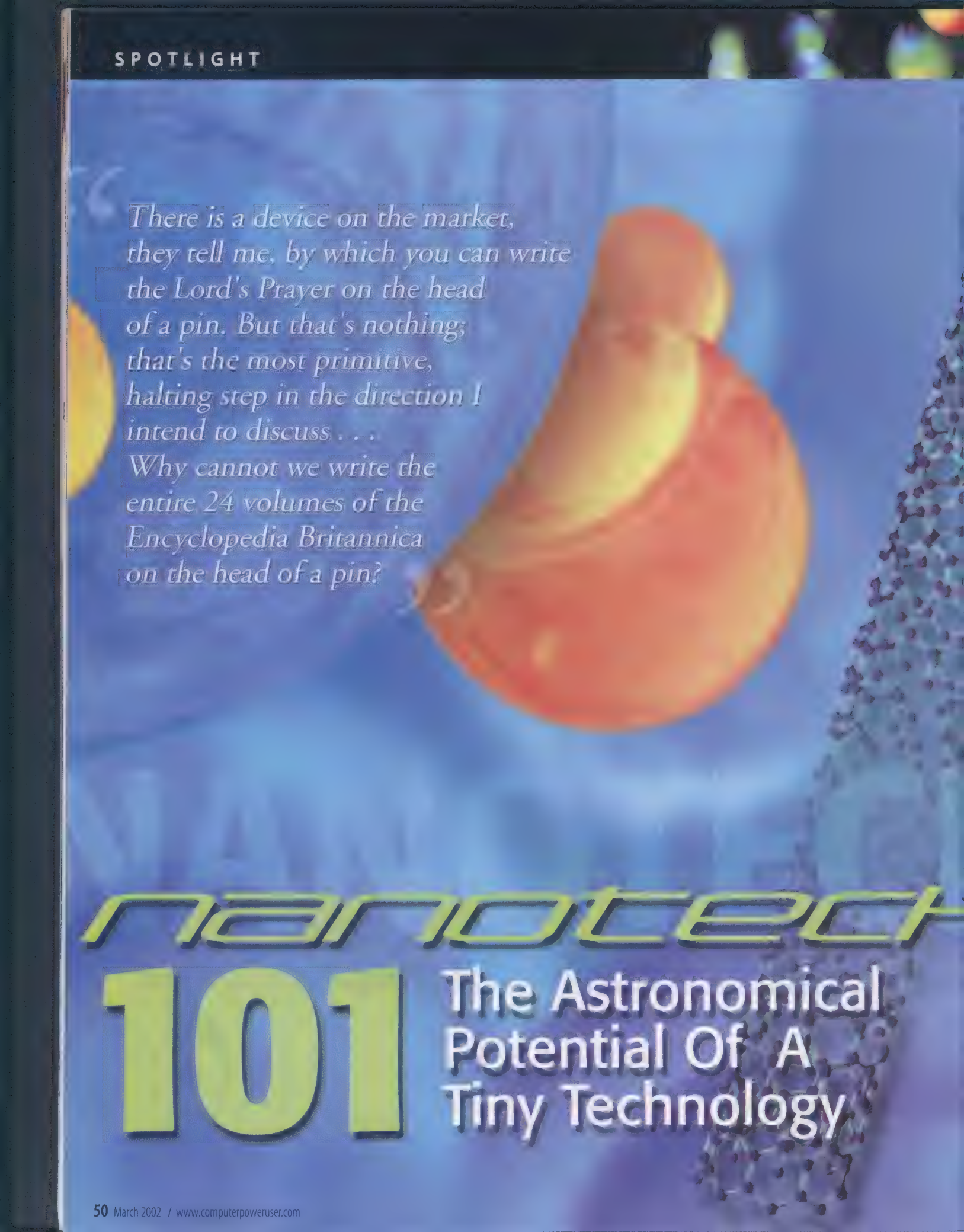
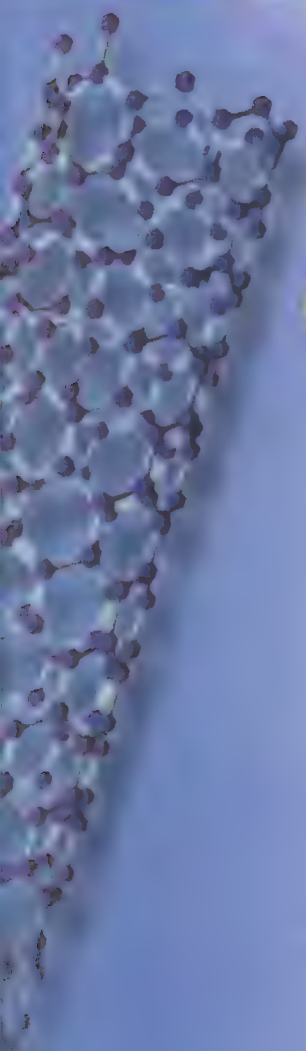


There is a device on the market, they tell me, by which you can write the Lord's Prayer on the head of a pin. But that's nothing; that's the most primitive, halting step in the direction I intend to discuss . . . Why cannot we write the entire 24 volumes of the Encyclopedia Britannica on the head of a pin?

nanotech 101

The Astronomical Potential Of A Tiny Technology



nology

by William Van Winkle

This is the opening of a talk Richard Feynman, one of the greatest physicists of the 20th century, gave Dec. 29, 1959, opening the door on the era of nanotechnology. Feynman discussed making a computer powerful enough to perform facial recognition and shrinking it to submicroscopic levels. He mentioned swallowing a mechanical surgeon that could perform internal repairs. He raised the possibility of building machines that could make smaller machines, which could make smaller machines still, down to the molecular level to manipulate individual atoms. This theoretical device is now known as an assembler.

Nanotechnology is about manipulating matter on the atomic level. With nanoelectronics, we'll achieve processors that make today's 2GHz chips look like they run on vacuum tubes. With nanostorage, libraries will store their entire collections on a pocket-sized disc, or cube, or whatever form tomorrow's media takes. Nanoengineering will let us fabricate super-thin, diamond-hard coatings on household furniture, just as nanomedicine lets us dock with cells to target malignant diseases. Describing nanotechnology as the wave of the future is a gross understatement. Like electricity, nanotechnology will permeate virtually every facet of our lives.

What Is Nanotechnology?

Often, nanotechnology is defined as a broad field involving the manufacturing of substances or structures less than 100nm (nanometers) in dimension. To visualize this, imagine the pinhead that Feynman described that is 1 million nanometers in diameter. By comparison, an atom is a few tenths of a nanometer across.

When K. Eric Drexler coined the term nanotechnology in his seminal 1986 book "Engines of Creation," he provided this much narrower definition: "Technology based on the manipulation of individual atoms and molecules to build structures to complex, atomic specifications." In this context, nanotech is often more accurately called molecular manufacturing, and it's here some of the most mind-boggling research for the 21st century is under way.

Building Blocks At The Bottom

It's an overused image, but LEGOs are the most useful metaphor for describing molecular manufacturing. (A downloadable book on the subject is available at mrsec.wisc.edu/edetc/LEGO/bookindex.html.) Atoms and molecules are like tiny building blocks. You can maneuver them into new shapes if you're dexterous enough with your tools. Imagine a LEGO house; now rip it apart and rebuild it as a Tie Fighter. Maneuver the carbon atoms in your pencil's lead into, ta-da, a diamond.

There are rules. You can't turn an oxygen atom into an iron atom any more than you can turn a six-bump LEGO into a LEGO wheel. But if raw materials are present, it's theoretically possible to rearrange atoms one by one into an

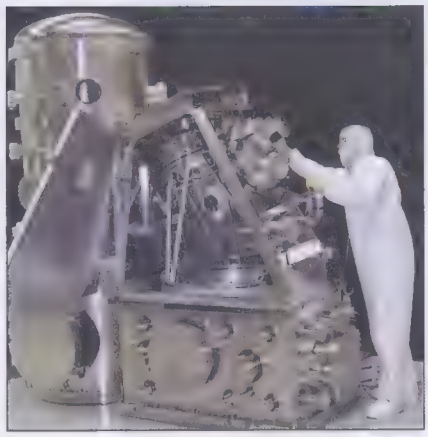
entirely new form, actually transforming matter. The trick is being able to grab the atoms, move them, and make them stick where you want. There are two approaches for going about this: top-down and bottom-up. Each approach has its own problems.

Top down. This approach entails starting with larger structures to manipulate the smallest materials. Feynman laid out a respectable concept when he discussed big machines building smaller machines, which build smaller machines, on and on. This means a lot of manufacturing, with many levels of machines designed only to make smaller machines. At the bottom level, the machines switch roles and become nanoassemblers, directly manipulating atoms and molecules.

James Von Ehr embarked on this path in 1997 by founding Zyvex (www.zyvex.com). The company's mission is to build nanoassemblers, or make the nanoscale tools so other companies can revolutionize the manufacturing of their materials. However, the initial challenge proved far greater than predicted. Von Ehr is now focusing on producing MEMS (microelectromechanical systems) that can build micron-scale machines with parts etched from silicon substrates. The company hopes these will enable the construction of smaller assemblers, although the scale difference between MEMS and that of a nanoassembler is roughly a factor of 1,000.

The assembler Drexler popularized in "Engines of Creation" is capable of producing practically any known substance, and some undiscovered: "Because assemblers will let us place atoms in almost any reasonable arrangement . . . they will let us build almost anything that the laws of nature allow to exist. In particular, they will let us build almost anything we can design—including more assemblers. The consequences of this will be profound because our crude tools have let us explore only a small part of the range of possibilities that natural law permits."

Zyvex has received its share of criticism, and many scientists believe the assembler concept is fundamentally flawed. In 1989, two researchers at IBM Almaden Research Center demonstrated a simpler top-down approach using an STM (scanning tunneling microscope)—invented by IBM in 1981—to move 35 xenon atoms into a pattern of the IBM logo. This was admittedly done at -270 degrees C, but experiments in the 1990s achieved similar atomic manipulation with both STMs and atomic-force microscopes. With microscopes, you can charge the sensing tip such that it's able to move atoms rather than only detect their positions. To date, though, no one has taken the next logical step and repositioned atoms into 3-D structures.



This prototype of Intel's EUV alpha tool will be the heart of CPU fabrication lithography later this decade. EUV lithography works with light waves so narrow they must be reflected rather than beamed through optics because glass would absorb the energy.

Bottoms up. The bottom-up approach hinges on the idea of self-assembly, or building larger components out of smaller ones. Bring two compatible single people together, give them the right environment, and nature gives you a self-assembled couple. Atoms and molecules can behave the same way.

One of the more famous self-assembly examples is carbon nanotubes, structures that look like straws made from chicken wire. In the 1980s, scientists were thrilled with buckeyballs, soccer ball-shaped objects made of C60 atoms (essentially carbon atoms rolled into a ball) that formed during graphite vaporization. In 1991, NEC's Sumio Iijima showed that the same substance could form multilayer tubes, with smaller tubes measuring slightly more than 2nm across. The ability to produce single-layer nanotubes in quantity was shown in later experiments, with applications including nanoscale test tubes (one end open, the other closed), silicon-mounted transistors, and incredibly strong fibers for reinforcement of hard materials.

Terms To Know

assembler—A nanoscale machine designed to construct practically any feasible molecular structure from surrounding atoms and molecules.

atomic manipulation—Moving atoms into desired, precise positions done most often with a scanning tunneling microscope or an atomic force microscope.

biodevice—A microscale or nanoscale machine designed to interact with the body, most often at the cellular level, done either by docking with cells or entering into them.

DNA—Deoxyribonucleic acid. Long, double-helix-shaped chains of nucleotides containing the genetic instructions for making cells. Because of the ways DNA nucleotides bond, researchers are exploring DNA as a storage or computational medium.

MEMS—Microelectromechanical systems. A generic term that covers any microscale electrical/mechanical devices.

microscale—Particles, devices, etc. with dimensions measuring in micrometers.

nano—As a prefix, means 10 to the minus ninth power, or one billionth.

nanocomputer—A computer fashioned from components crafted on the scale of 100nm or less, presumably resulting in a computer with dimensions on the same scale.

nanoscale—Particles, devices, etc. with dimensions measuring 100nm or less.

replicator—A device able to make a copy of itself. In the top-down approach to molecular manufacturing, replicators would make smaller versions of themselves.

Harvard chemistry professor George M. Whitesides is working on another striking example of self-assembly, taking his cue from amino acids that self-assemble to form 3-D proteins. Using tiny polymer blocks prewired with transistor-like devices, certain patterns of solder dots are applied on specific sides of each block. Like a game of dominos, block faces with two solder dots bond with other faces featuring two solder dots. The theory is that if you suspend these blocks in water, the faces will bond appropriately and construct the first functional, self-assembled, 3-D electrical circuit.

In The Chips

You don't have to wait for self-assembly to experience nanotechnology. If you're reading this magazine, you're probably already using nanoscale computing in everyday life.

"People misinterpret the sizes involved in microelectronics," says Jerry Marcyk, Intel's Components Research Lab director. "The Pentium III Tualatin is built on a 130nm technology. However, the typical transistor in that chip has a horizontal measurement of only 70nm. You ask when we're going to start using nanoelectronics. Well, it's already in mass production today."

According to Marcyk, Intel's next manufacturing node will be 90nm in 2003, producing transistors actually down to 50nm. In 2005, transistors will be down to 30nm. In fact, Intel already has fully functional 15nm transistors running in its labs, but these aren't due to reach production until 2009.

To reach sub-30nm sizes, however, Intel must forsake its current DUV (deep-ultraviolet) lithography methods and move to an EUV (extreme ultraviolet) method. EUV radiation carries on such a narrow wavelength that the process must work in a vacuum because any substance will absorb EUV, including air molecules and even the glass optics used in conventional lithography. To make the process work, researchers needed to devise the most perfect mirrors known to man to bounce and concentrate the wafer's feature blueprint down to nanoscale dimensions.

Intel is developing another nanotech process for chip fabrication called atomic layer deposition, which can create wafer layers only one molecule thick. Technicians place a silicon wafer in a vacuum chamber and then introduce a gas. The gas molecules stick to the wafer's surface, but only to the depth of one molecule. Everything else bounces off. A second gas is introduced that reacts with the first and forms a new molecule, still leaving that layer only one molecule thick. By introducing gas A, then B, then A, then B, manufacturers grow multiple layers that are each only one molecule thick. These thinner layers translate into faster speeds and less power consumption.

Moore's Law assumes that transistors will remain a fixture in processors. This may not be so, at least not in terms of how a transistor is normally constructed. A Hewlett-Packard/UCLA effort headed by Stan Williams, Phil Kuekes, and James Heath made headlines in 1999 by using a single custom-designed molecule called rotaxane between two crossed wires, making the world's first molecular circuit. The trio is also experimenting with a self-assembly method wherein a prewired silicon wafer is dipped in water and topped by an

Look For Nanotechnology In These Unexpected Places

Nanotechnology has applications far beyond computers, many of which are already in production. Houston-based NANOTECHNOLOGIES (www.nanoscale.com) provides nanoscale particles in the form of dry powders to manufacturers. According to Denny Hamill, vice president of marketing, two early applications for company products are hard optical coatings and energetic materials.

"By energetic materials, I mean specifically nanoaluminum particles below 40nm in diameter," says Hamill. "The particles like to oxidize so fast that they just do it in the air and spontaneously combust. This is a government application where they need to substitute a material for lead, in this case for primers in munitions. On the optical coating side, a lot of people have been using silica for scratch-resistant coatings. We're selling sub-15nm alumina, which, in its bulk form, alumina is about 100 times harder than silica. You're seeing this on everything from plastic lenses to displays in portable electronics."

An upcoming military goal with nanotech is replacing depleted DU (uranium) projectiles. DU ammunition has the desirable quality of being self-sharpening upon impact. Of course, DU is also toxic to those who handle it. Currently, the Department of Defense is examining the use of nanocrystalline tungsten heavy alloys, which are similarly self-sharpening but nontoxic. The Army is also dedicating $10 million annually toward its Institute for Soldier Nanotechnologies, which aims, among other goals, to weave biosensors into soldiers' clothing to monitor their vital signs, as well as construct lightweight uniforms that will be ballistic and chemical-warfare proof.

Nanoscale silica or carbon particles also help make aerogel, an amazingly hard gel substance that's nearly transparent, almost as light as air, and can withstand temperatures from -50 to 3,000 degrees F. Possible aerogels applications range from air filtering to high-density battery cells to building insulation. In January 2001, Italian clothing manufacturer Corpo Nove showcased its aerogel-lined Extreme Weather Jacket ($2,700), slated for sale by Hugo Boss.

"What is the impact of nanotechnology?" muses Mihail C. Roco, National Science Foundation senior advisor and a key voice President Bush hears on nanotechnology development. "I will say that it will be very broad, from medical to electronics to materials to environment. This is a length scale and a group of approaches that will affect almost all activities that we do. For companies that do not enter this field, like in advanced materials or biodevices or electronics, it's possible that five to 10 years from now, they'll be out of business."

ultra-thin layer of special molecules. This layer bonds to the silicon, with the molecules acting as gates between the wires. When fully developed, Williams expects people will be able to make CPUs cheaply in their own homes.

The Pack Rat's Paradise

When IBM unveiled the first hard drive in 1956, it used 50 platters in a box the size of a refrigerator, storing just 5MB. Roughly 20 years later, IBM's San Jose Research Center's director predicted that magnetic aerial densities, or the amount of data that can fit on a given area of magnetic media, would max out at 2 million bits per square inch. By next year, however, IBM expects densities to reach 100 billion bits per square inch thanks to new nanotechnology called AFC (antiferromagnetically-coupled media), a.k.a. pixie dust. Rather than using the traditional single layer of magnetic coating for data storage, AFC uses two layers, each with smaller particles than previous-generation technology. A sheet of ruthenium only three atoms thick separates these two layers. This ruthenium lets the parallel particles above and below couple in opposing magnetic directions, a property that enables smaller particle sizes (higher capacity) and thus more particles being read by a head moving at conventional spin speeds (higher throughput).

Like transistors, magnetic particles have physical limits. The search for better solutions is on. IBM's leading contender is Millipede (www.zurich.ibm.com/st/storage/millipede.html), in many ways a scaled-down, turbo-charged phonograph. Grids of 0.3-micron-thick cantilevers—LP-like player arms with pointed silicon needle tips measuring less than 20nm—are heated and poke a divot into plastic substrate to write data. The unheated tip drags across the plastic surface, reading divots almost like Braille. IBM ultimately expects to achieve densities hundreds of gigabits per square inch.

Hard platters aren't the only media nanotech is transforming. Last November, Fuji Photo Film USA announced a new process called NANO CUBIC. It will enable floppy-type diskettes with 3GB capacities and backup tapes capable of storing a terabyte (1,000GB). The company's 1990s-generation technology, ATOMM (Advanced super Thin layer and high Output Metal Media) was licensed to a small company called Iomega a decade ago, spawning the Zip disk. ATOMM used a coating with microscale dimensions. NANO CUBIC shrinks to the nanoscale, yielding another 10X capacity gain.

Growing Nanotech

In FY 1997, Uncle Sam spent $116 million on nanotech R&D. By 1999, that doubled to $260 million, escalating to $422 million in 2001, and the present $568 million in 2002. Of the last amount, the National Science Foundation receives $199 million compared to $144 million for the Department of Defense. Where's the return on investment? According to Mihail Roco, National Science Foundation senior advisor, in 10 to 15 years nanotech companies will annually generate $1 trillion in products worldwide.

Carpet cleaners. Light-sensitive windowpanes. Secure quantum-level communications. Massive computation with DNA structures. Wall-sized, high-resolution displays. Compounds that eliminate environmental pollutants faster than you can say Greenpeace. The list of present and possible nanotechnology applications is staggering, dazzling, and terrifying, but real and happening. Your entire world is about to change, starting at your front door.

"For starters, the paradigm of having one person feed information into one computer is going to get broken," says Intel's Jerry Marcyk. "Imagine not having one computer but hundreds of computers in your daily life. All of those computers will have sensors in them and be able to anticipate things for you. Ten years from now, you're going to have a microprocessor in your doorknob. You might say, 'Well, that's a stupid idea,' But why would you want it? So you wouldn't need a key. Think about that. That's how prevalent electronics and processing is going to be." CPU

by William Van Winkle

That's About The Size Of It

We can grasp nanotechnology with numbers and symbols, but actually feeling its scope visually in real-world proportions is almost impossible. In the case of carbon nanotubes, comprehending nanoscale dimensions is literally like grasping at (vaporized graphite) smoke. The smallest we can make devices today is at the microscale. Nanoscale machines must be 1,000 times smaller still. In many nanoscience fields, this is impossible with today's technologies. In other fields, such as optical lithography in CPU construction, cutting-edge systems can create structures at this scale.

To visualize the minute scale scientists are working at, consider this from Chris Philippi, business manager of EUV LLC: "One of the guys at the national labs used this analogy: What we're trying to do is equivalent to trying to print an image the size of a quarter on the surface of the Earth from the space shuttle out in space and print that image extremely accurately time after time after time."

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Where Nanotechnology & The Computer Industry Meet

Shrinking The PC

Think that tiny CPU powerhouse in your hopped-up desktop rig is an impressive hunk of hardware? Don't get cocky, kid. If all goes according to plan in the labs at Bell, HP, IBM, and startups around the world, advances in nanotechnology will make your 1.8GHz kick-butt processor look like an abacus. In fact, one of the leaders of the nanotechnology revolution, Stan Williams, head of Basic Research at HP Labs in Palo Alto, Calif., claims, "The age of computing has not yet begun." By designing circuits and microprocessors that are smaller than the eye can see, "It should be possible to compute at least 1 billion times (and possibly much more) more efficiently than is currently possible. When we consider how much more powerful such systems would be, our current technology is trivial by comparison."

Williams is talking about the real new, new thing: nanotechnology, or the ability to manipulate simple materials at the molecular level, in this case, to make functioning computer components that are a thousandth of the width of a human hair. Instead of etching transistors onto silicon that is microns wide, emerging techniques will rearrange molecules and atoms that are nanometers wide in materials such as carbon and even crystals so that they can be made to act as transistors, wires, or even processors in computers that are thousands of times more powerful than the ones we use today. These new techniques will let computer processor and storage manufacturers get beyond the natural limits of writing transistors onto silicon, a limit most experts believe we will hit in the next 15 years.

A Glimpse At The Goal

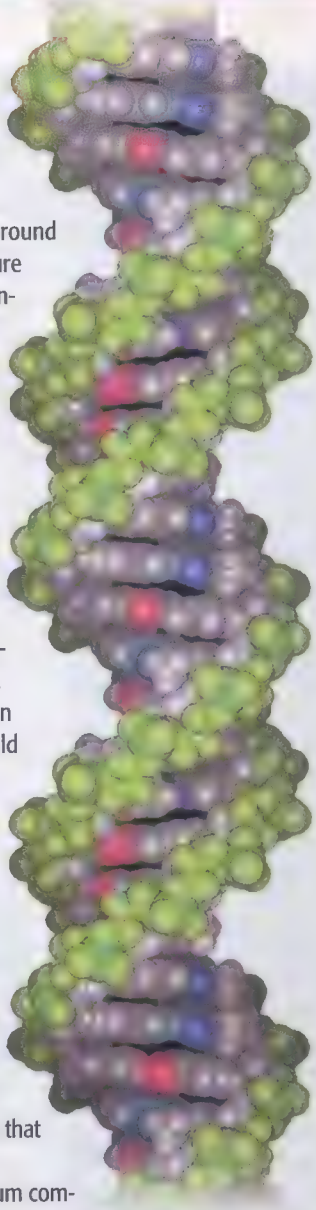
Nanotechnology breakthroughs that occurred this past year are likely to fundamentally transform the ways in which computers are made, their size and cost, and their basic computing power sometime in the next two decades. According to Dr. Chris Murray, manager of Nanometer Science and Technology, IBM Research, "What we are doing now will be dramatically changing how we look at computing in 2015." Nanotechnology will likely target and overcome familiar bottlenecks and weaknesses in computer and PC design.

Not only will CPUs be much smaller (up to 60,000 times smaller, by some estimates), but their power use and heat dissipation will be reduced exponentially by our ability to use materials other than silicon and to manipulate the very atoms and physical properties of these new building blocks for computing power. Ultradense, nonvolatile memory systems will be possible, says Murray. Just as important, adds Williams, is the reduced cost of manufacturing processors and storage devices through chemical processes that do not require the expensive "clean rooms" that are

How Small Is Small?

On what scale do nanoresearchers work? A nanometer is a billionth of a meter and one thousandth of a micron. By comparison, a human hair is 200,000 nanometers thick. The ability to construct computers and storage at this scale may someday place the entire contents of the Library of Congress into a device the size of a sugar cube, said President Clinton when he announced enhanced nanotechnology research funding in 2000.

The Year Nanotechnology Breaks Out



Nanotechnology moved back into the spotlight in 2001 because of numerous breakthroughs in labs around the world that helped move us that much closer to a future of nanocomputing. Indeed, Science magazine named nanotechnology the Breakthrough of the Year.

The federal government's National Nanotechnology Initiative of 2000 has helped spur interest and new investment so that a number of timers are popping on nanoresearch that has been in the oven for some time. Public funding for nanoresearch increased from $270 million in 2000 to $422 million in 2001, and it will grow again to $518 million in 2002. Meanwhile, the Internet crash has left venture capitalists scrambling for the next big thing, Stan Williams, head of Basic Research at HP Labs in Palo Alto, Calif., told the Nanotech Planet 2001 conference in late November. The money is starting to rush in.

- In January, Harvard scientists demonstrated that silicon nanowires, or wires that are 20 nanometers wide, could be manipulated into something that resembles a basic circuit.
- In April, IBM researchers succeeded in assembling an array of transistors from carbon nanotubes, the first step in putting these nanometer-sized materials to use as basic elements of computer technology.
- In October, Bell Labs announced it had developed the first organic (carbon-based) transistor with a channel length of one molecule, less than two nanometers.
- In December, researchers at the Weizmann Institute of Science in Israel announced the first programmable biological computer, essentially altered DNA molecules that process 1s and 0s. Later in the month, IBM scientists announced they had constructed a rudimentary quantum computer, seven atoms that could be programmed to recognize the numbers 3 and 5 as factors of 15, demonstrating that individual atoms could be rearranged to perform computations.

now used to build virtually all silicon-based chips and processors.

Oh, The Possibilities

"Nanotechnology is dominated by the fact that we are moving into a world where the individual constituents of matter can be seen," says Murray. "It's about making small collections of atoms and molecules carry out functions. As we push down to the nanometer scale, now every atom counts." The major players in computer technology are investing big in nanotechnology research because it looks like the best hope for getting beyond the physical limits of silicon-based memory and processors.

Given the current rate at which circuits are being miniaturized, we should reach the physical limitations of the material within two decades. The distance between circuits on a CPU will become so narrow that electrons from one path will begin leaking and disrupting its neighbors, a phenomenon of quantum physics, a unique set of physical laws that scientists see only when they get down to the level at which atoms interact. Nanotechnology will probably be able to harness quantum physics rather than be hampered by it, and so more circuits with much shorter informational paths can be packed onto submicroscopic spaces. If this occurs, and no one knows for sure that it will, the potential for increasing computing power and speed can increase exponentially.

Optical computing. Another nanotechnology dream is optical computing, in which light photons replace electrons as the medium for transmitting 1s and 0s, possibly through different types of polymer materials, proteins, or even algae. Computing by photons could increase transistor speed more than 1,000 times over current limits. And at the high end of nanocomputing lie quantum computers. By using atoms as a kind of transistor and exploiting the quantum mechanics that govern subatomic particles, a quantum computer could move beyond digital processes (1s and 0s) and perform massive numbers of calculations all at once. This is the theory driving Stan Williams' dream of computing a billion times faster than we do today.

Far from being merely future technology, nanotechnology research has already helped advance current computing substantially. For instance, nanotechnology research in the 1980s helped point the way to the quantum weld lasers that manipulate microscopic layers of data on current CD writing drives. Likewise, the latest techniques for packing more data onto hard drives come from "the esoteric experiments on giant magnetoresistance done in the later '80s and brought into the industrial setting," says Murray. Because of these preliminary nanotechnology experiments, we now see hard drive densities increase more than 100% each year.

Despite the fruits of early research, prospects for nanotechnology computing really broke out in 2001 because of a series of major advances. (See the "The Year Nanotechnology Breaks Out" sidebar.) With developments such as a working transistor 50,000 times narrower than the width of a human hair, it is now possible to imagine nanocomputers so small that they can be embedded directly onto a credit card, into clothing, or even suspended in liquid so processors can be printed onto any material.

A New Jargon

If you are reading this magazine, you already know the difference between a PCI and an AGP slot or why eight-nanosecond

A Look At The World's Tiniest PC

Tiqit's Matchbox PC isn't exactly a computing powerhouse (it uses a 486-SX processor running at 66MHz), but it wasn't meant to be. What the Matchbox PC lacks in brawn, it makes up for in size: The MPC is about the size of a credit card and can run Windows 95, NT, and Linux.

"The Matchbox PC was a demonstration. It was not meant to be a finished product," says Ian Blasch, CEO of Tiqit. "What we were trying to project with the MPC is that you can build an x86 system that small."

Despite the fact it's an unfinished demo, the little computer has been popular with consumers. Its market consists primarily of hobbyists, research and development centers, and government labs. "These are people who have a very specific application in mind," Blasch says.

Finding parts. Tiqit designed the MPC about two years ago. "The biggest issue was the parts that were available. The industry is not focused on building small PCs. Everything from connectors to processors to screens have been optimized for power, not necessarily for size. That was one of the issues that we really struggled with. Unless you have a huge war chest behind you and can build custom-made components, it is difficult to it get it down to a size that is agreeable to the user," he says.

As a result, many parts in the MPC came from the cell phone industry, which does place a premium on size. The 486 chip, which was underpowered even two years ago, was chosen because it was one of the smallest processors available.

"From a usage standpoint, you have two big data points: laptops and PDAs. PDAs today are not true handheld computers. You can have a lot of CPU power in a laptop or very little in a PDA. We're trying to straddle this middle ground," he says.

The biggest benefit is you can run standard x86 applications on a small platform without resorting to the specialized code necessary for a PDA OS or embedded system. There are tradeoffs: Some things just can't be done in such a small form factor. For instance, PC cards use standard interfaces that just can't be shrunk.

So don't worry if this isn't exactly what you were hoping for. The Matchbox is just the beginning. "We are working on products that blow the Matchbox away," Blasch says. The company's next product will be announced at CeBIT in March.

by Kevin Savetz

Here are the numbers behind the Matchbox PC.

Name: Matchbox PC
Manufacturer: Tiqit (www.tiqit.com)
CPU: 66MHz 486-SX
Memory: 16MB SDRAM
Storage: 1GB Microdrive
Features: Ethernet, two serial ports, parallel port, floppy port, IDE controller
Dimensions: 2.75 inches high x 1.97 inches wide x 0.95 inches deep
Weight: 3.3 ounces

seek times are better than 12. But are you ready for the next generation of techno-jargon? The implications of nanotechnology on everyday computing revolve around a techno-speak lexicon that will be new even to the most cutting-edge computer geeks.

Nanotubes may be the building blocks of computing in the next decade. Discovered in 1991, they are hollow cylindrical molecules of carbon atoms. The ways in which the atoms meet to form a cylinder determine the nanotube's conductive properties. Not only are nanotubes hundreds of times stronger than steel, but they are also excellent electrical conductors and can be manipulated to perform as transistors, the basic element in building memory and processors that are only nanometers thick. IBM researchers are especially optimistic that nanotubes will replace silicon someday, as its researchers are already making rudimentary circuits from the material.

Nanotubes are versatile enough to affect all aspects of computing as we know it. They could be applied to new types of capacitors, longer-lasting batteries, magnetic storage, and even flat-screen displays. In fact, Texas-based Carbon Technologies is already mass-producing and selling nanotubes to researchers at $500 a gram. Chips made purely from nanotechnology are more

A Better World Through Molecules

Long before we wear nanocomputers under our skin or in our clothes, the field of nanotechnology is likely to give us a number of these more immediate advances:

Soft Lithography. A new approach to stamping a pattern (such as a circuit) onto a material using soft rubber nanostructured forms. This technique could allow for nano-sized circuitry that can be printed onto materials other than silicon and will not require costly clean room production facilities.

MRAM (Magnetic RAM). This would be a high-density, nonvolatile type of memory of microscopic size so that operating systems and massive amounts of data could be booted and accessed quickly on a device of any size.

AFM Storage. AFM (Atomic Force Microscopy) that is used to see and manipulate atoms in nanotechnology research uses tips that are a single atom wide. These tips may someday be arranged into arrays so that they can read and write data that are packed much more tightly than we find on today's CD-ROMs and hard drives.

than a decade away by most estimates. But some say we are likely to see some sort of hybrid technology in the interim. For instance, within the next five to 10 years, memory chips could enjoy massive storage capacity gains by combining traditional silicon with nanotechnology materials.

CPU, Build Thyself!

A major roadblock in making nanotechnology available for general use is converting the enormously expensive techniques now required to manipulate molecules and atoms to an affordable mass-production process. Scientists are hoping to develop techniques for inducing materials to bond with one another and assemble themselves into working structures in much the same way that molecules in nature are able to organize themselves into functional cells, which is called **self-assembly.**

Researchers are currently looking at ways in which heat, electricity, and even organic elements such as proteins can be applied to certain materials so that in the future they rearrange their own molecular structures to create working circuits and process the digital information at the heart of computing. Bell Labs recently announced development of the first organic transistor, a carbon material that assembles itself into a circuit when the right chemicals and materials are combined. While some CPUs, such as the P4, now have 180 nanometers (0.18 microns) between their electrodes, the Bell Labs transistor had a channel size of less than 2 nanometers. Better still, because it was created by a chemical interaction rather than precise etching onto silicon, a nanodevice such as this can be made without high-priced dust-free "clean rooms" required by silicon-based chip manufacturing.

The world of nanotechnology has also spawned the common use of a phrase that is unimaginable under current technology: fault tolerance. Although most technical flaws in a modern silicon processor can be fatal to the proper operation of a CPU, defects will be standard in nanotechnology materials. When working at the molecular level and with billions of operations, flaws are in-evitable, says Williams. A key component in nanotechnology's advance will be fault-tolerant architectures, which can complete a computation along any of many possible paths in a nanotechnology chip. When one data path is broken, the technology will be able to find an alternative that will get the job done. Members of Hewlett-Packard's collection of research partners have already demonstrated redundant wiring techniques, which let data reroute itself around flawed molecular switches.

The Living Computer

Computers with inherent imperfections? Circuits that assemble themselves? Perhaps the most wondrous aspect of future computing under nanotechnology is that machines made from manipulating molecules and atoms will behave more like living organisms. As a result, the highest of high-tech research reverts back to contemplating the ways in which organic processes can be harnessed and rearranged to push the 1s and 0s upon which the digital age is built. Even an abstract researcher such as IBM's Murray marvels at the simple possibilities of this new science. "There are natural forces that allow very complex and beautiful things," he says. CPU

by Steve Smith

The New Science Fiction

Even now, more than a decade before we are likely to see a working chip based on nanotechnology, futurists of both the sensible and wild-eyed varieties are imagining radical implications of nanocomputing. On the more esoteric side, some are envisioning computers so small yet smart that they can be placed in the human body to detect chemical imbalances and release the necessary drug treatment. The current "smart" cards will look like prehistoric dunces compared to Visa cards imprinted with microscopic processors that are many times more powerful than today's mightiest desktop PC.

On a more familiar note, bringing basic computing processes down to a molecular scale will increase the amount of processing power available to us exponentially. Future technology such as truly human-like artificial intelligence or robotics becomes feasible when billions of computations can be done in microscopic space. Nanotechnology computing will be able to make use of massively parallel processing so that literally billions of elements can work simultaneously to solve a computation, says Dr. Chris Murray, manager of Nanometer Science and Technology, IBM Research.

Whether we look to nanotechnology for more raw processing power or just teeny, tiny digital devices everywhere (and it probably will be both), these developments are likely to change the ways in which we interact with computers. PCs will not sit mute on our desktops. They will talk and interact with us in ever more human ways. And with so much computing power available in microscopic form, the computer itself will become more of an active agent in our world than we can imagine.

Nanotechnology's Long Road To Reality

Uncovering The Potholes & Promises

Fiction writers from Isaac Asimov to Dean Koontz have entered nanotechnology into the public mind as something grand, sometimes terrible, but always (ironically) larger than life. There are promises that absolute control over atoms and molecules will give mankind the power to fabricate any material, solve any problem from disease to ozone depletion. Others argue that the farther into the fabric of physics and chemistry we reach, the greater the devastation we'll unleash on ourselves.

Against this backdrop, companies are leaping into nanotechnology product development and governments are throwing money at the field. In the aftermath of the dot-com devastation, Wall Street is looking to nanotech as the next big play.

But is nanotech all hype? Are enthusiasts and critics equally out of line? Yes and no.

Little Machines, Big Problems

Assume that Foresight Institute chairman K. Eric Drexler's vision in his book "Engines of Creation" comes true and scientists design self-replicating nanobots to interface with our cells. A virus already fits this description. The bottom-up design approach of nanoscale construction is modeled on natural processes. An inescapable part of nature is mutation. We know technology can malfunction. Is it infeasible that nanobots designed to bolster an immune system might actually destroy it?

For conspiracy fans, here's another catch: If doctors one day can remotely control nanobots in our bodies, why couldn't crackers take command of them? The President's? Consider the recent anthrax problem. Could someone construct self-replicating, virtually undetectable agents to devour human bone marrow? Chlorophyll?

The ultimate end-of-the-world nano scenario is commonly known as "gray goo." The scenario postulates that assemblers continue self-replicating and assembling but never shut off, turning Earth into gray goo.

Most experts assume nanobots will become tiny versions of macroscopic machines. More probable than gray goo is nanotech repairing or sustaining cells and drawing out the aging process. In ancient Egypt, most people died in their 20s and 30s; today's average lifespan is around 70. Even if nanotechnology only allowed that lifespan to double, prolonging the body doesn't necessarily mean preserving the

Not All Problems Last Forever

We've all heard or read about people who spoke too soon. Remember Bill Gates' 1981 quip, "640K ought to be enough for anybody." In 1949, *Popular Mechanics* predicted computers would one day weigh only 3,000 pounds and add up to 5,000 numbers per second. The Earth is flat. Man-made objects can't fly.

These assertions were bound by the common sense that ruled their day. We probably shouldn't fault them because their speakers couldn't see into the future. Most outlandish ideas fall into the abyss of forgotten history. Those ideas that survive often shape our history.

Sure, assemblers able to transmute one substance to another seem absurdly impossible today. However, before it was called gravity, the natural law that objects always fall toward the ground seemed immutable until someone devised a form of anti-gravity with magnets. Many hurdles can be jumped.

For example, carbon nanotubes have been recognized for years as a leading candidate for future transistor technology. The problem was that although carbon nanotubes could be synthesized in mass quantities, the yield contained a mixture of metallic and semiconducting nanotubes that would stick together, forming ropes or bundles. Only semiconducting nanotubes are useful as transistors, and the proximity of the metallic nanotubes rendered them all but useless. In such quantities, manually separating the semiconductors was practically impossible. Carbon nanotubes reached a brick wall.

In April 2001, IBM scientists devised constructive destruction, a process wherein a mass of mixed nanotubes is deposited on a silicon-oxide wafer. A lithographic mask applies metal pads over the nanotubes. With the wafer acting as an electrode, the semiconducting nanotubes were switched off to prevent current from flowing through them. A controlled blast of voltage was sent through the wafer, destroying the metallic nanotubes and leaving the semiconductors behind.

Many more examples come from Intel Labs. Years ago, experts said mass producing transistors under 1 micron couldn't be done. Today's fab processes are at 0.18 micron and 0.13 micron. No one is saying now how small transistors can get, but there's concern that Moore's Law will be crippled by heat.

"Heat is probably the biggest issue the semiconductor industry will face this decade," says

mind. Imagine the economic, social, and food-supply problems if the average person loses his mental faculties during middle age.

Small Science, More Problems

Before you worry about being converted into gray goo, realize no one has designed a self-sustaining, self-replicating machine outside of the biological sphere. Consider the problems at any scale. If you build a 10-foot robot to extract ore from a mountainside so it can fabricate a copy of itself, where will it get the required energy for mining and smelting? If a nanobot could exist in the bloodstream, would it have to cannibalize body minerals? Would it create energy as cells do or tap into electrical impulses zipping through the nervous system? No one knows these answers, yet. At best, there are only vague, untested ideas.

Another blow to intravenous nanobots is the buffeting they would take. A nanobot that can enter a cell is like a tiny fishing dinghy trying to dock on a tumultuous river. A current shift slams the dock into the boat, randomly sending it off unable to steer. The only hope is using an overwhelming number of nanobots, like the thousands of sperm required to fertilize just one egg.

Assemblers also face many issues. One theory is that assemblers will use pincers (remotely controlled robotic arms) to lift and place atoms in locations. Even if this is possible, atoms tend to be sticky. Carbon atoms—the building blocks of much of our world—in particular bond firmly with one another. Breaking these bonds and forming new ones involves a lot of energy expenditure. In theory, the atoms would likely stick to the pincers. (Several of these arguments are refuted in Drexler's 1992 book "Nanosystems: Molecular Machinery, Manufacturing, and Computation.")

Practicality & Delivery

Developers face two problems. The first is devising nanoscale entities, be they smaller transistors or organic molecules acting as memory storage. The more difficult problem is applying the entities to real-world apps. Even if scientists can construct a molecular memory bank, what good are nanoscale features if macroscale wires must connect them? Nanowires are a solution, but no one knows how to sustain a useful connection without destroying them.

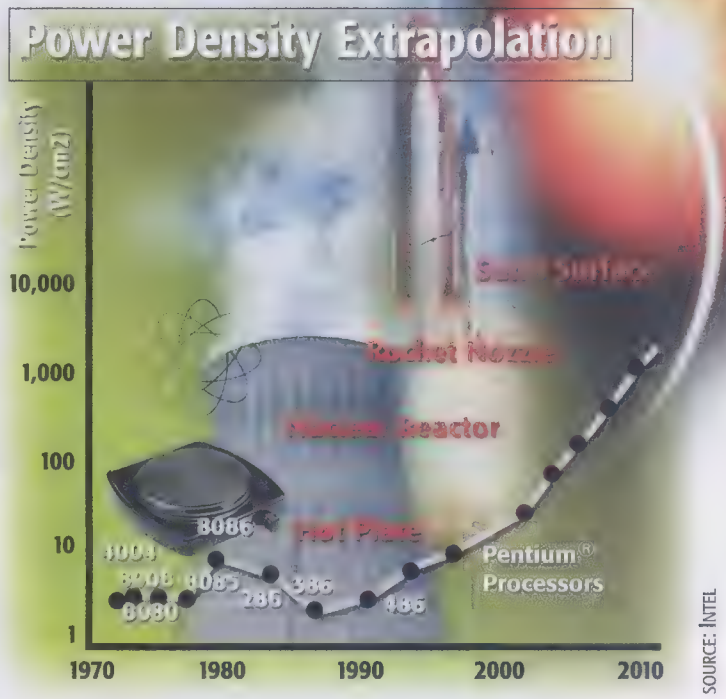
Intel's R&D policy once was that a prospective technology had to be able to turn into a marketable product or process within five years. Intel has backed off this, but a quick-buck mindset remains for much of the tech industry. The Clinton administration and Congress approved the National Nanotechnology Investment when the economy was booming. President Bush expanded spending, but cutbacks are possible if the economy worsens. Congressional report RS20589: Manipulating Molecules states, "two-thirds of the FY2001 NNI budget will focus on long-term, high-risk fundamental research distributed across all scientific disciplines" that may take up to 20 years to yield results.

Nanotech has seen its share of failed startups. There will be more. Lack of materials, private funding, and scientists are roadblocks. Thinking there's a quick solution to take us from start to finish is begging for disappointment. CPU

by William Van Winkle

Intel spokesperson Manny Vara. "Piece by piece, though, we're finding solutions. We're going to create a more modular processor, for lack of a better term, that turns a particular piece of the processor off when it's not being used so it won't create any heat. We're using new packaging techniques that will provide better cooling and even some software approaches we haven't announced yet. The whole idea is to increase performance but keep the heat at where it is today."

Assemblers and nanobots that combat cancerous cells may seem like a futuristic pipe dream, but, as K. Eric Drexler noted in the September 2001 *Scientific American* while faced with much hard criticism, many seemingly improbable nanotech designs have survived peer review. It's too early to call anything in nanotechnology impossible.



Years ago, PC techs used to joke about frying an egg on a Pentium. The power density ratio (W/cm2; watts per square centimeter) of future nanoscale CPUs is expected to reach the level of a nuclear reactor by the middle of this decade and a rocket nozzle by 2010.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The Bleeding Edge Of Software

by Warren Ernst

Inside The World Of Betas

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you six glimpses into the future of software.

Xitami 2.5b5

Official product name: Xitami
Version # previewed: 2.5b5
Publisher: iMatix Corp.
Developer and URL: iMatix Corp.; www.imatix.com
Product URL: www.xitami.com
ETA: Late Q1 2002
Why you should care: An excellent Web server alternative.

Microsoft's IIS and the open source version of Apache reportedly account for about 98% of the Web server market. They aren't the only games in town, however. Xitami is a free, robust alternative.

At times, Xitami seems too good to be true. For starters, it's extremely fast. At last check, I've been running it 81 days straight on a Win98-based server dishing out, well, only an average of 156 Web page views a day (this is a personal Web page). Xitami can saturate a cable modem or DSL connection on even modest hardware.

Xitami works on Windows 3.1/95/98/NT /2000/XP, NT Alpha, OS/2, Linux, Unix, and OpenVMS. Unlike Apache, you can handle configuration via any Web browser with simple Web page forms (you can also edit INI files), and unlike IIS on NT, Xitami isn't full of security holes. Xitami can also handle FTP server duties with the same aplomb.

Featurewise, Xitami has virtual hosting; customized and standard log formats; directory authentication; IP address masking; ISAPI support in Windows; PHP support throughout; and direct support for CGI scripts in Perl, Awk, REXX, Python, DOS batch files, and EXEs. Absent is support for Microsoft FrontPage extensions. SSLs is only available with the Xitami professional version ($99).

Xitami's best feature may be its loyal user base, which shares ideas via a mailing list read by developers. Most mailing list members use the beta versions rather than the release version—a testament to the software's quality.

Outpost Firewall Pro 1.0.1125 Release Candidate 1

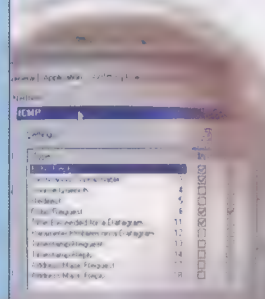
Outpost Firewall Pro looks like it has the goods to blow the competition away, and it isn't even final yet. Like the best software firewalls, OFP monitors how your software accesses your local network and the Internet, asking if you want to allow access. Soon, OFP stops asking and allows your frequently used software to go online. When a new app, such as spyware, tries to go online, you're alerted to check things out.

What sets OFP apart is its flexibility for setting up servers, assigning safe IP addresses so information doesn't get blocked, and determining how a protected computer responds to ping requests. OFP also supports a range of plug-ins for ad blocking, DNS caching, content blocking, and intrusion attempt reports.

My test beta didn't slow down a connection or PC any more than ZoneAlarm Pro or Norton Internet Security. I could not rigorously test its protection or scrutinize logs, however. With any security product, evaluate the beta carefully before implementing it in the real world.

The firewall blocks access, monitors network programs, and permits local Microsoft Network clients to share files and printers. OFP should make a few well-known software companies worry.

Official product name: Outpost Firewall Pro
Version # previewed: 1.0.1125 Release Candidate 1
Publisher: Agnitum
Developer and URL: Agnitum; www.agnitum.com
Product URL: www.outpostfirewall.com
ETA: Q2 2002
Why you should care: This software firewall may give the big boys a run for their money.



IMpersona 1.3 Beta

Some people think chatting with their buddies on MSN is a fairly personal experience. Evidently the programmers at famous3D don't think it is personal enough. Their answer is IMpersona, which adds a talking head and voice synthesis to a classic chat program. The results are generally good, but it probably won't become your sole chat program.

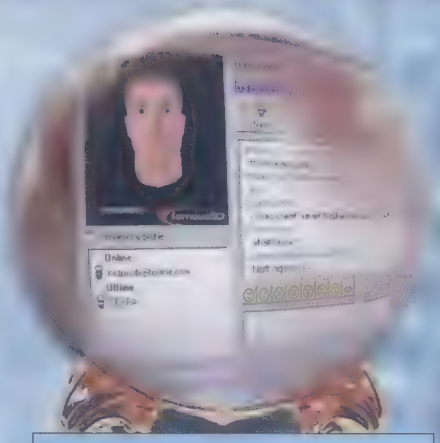
IMpersona only covers the basics. It lists the contacts from your MSN Messenger list in Online and Offline sections. Just double-click an online buddy to start chatting. The chatting area takes up the majority of the window, with text scrolling up as you chat. The talking head appears at the top-left corner, reading aloud what your buddy types. It's distracting at first but gets cooler and more natural with time.

The lifelike head blinks, looks around, smiles with the appropriate button use, and laughs when you type **lol**. The lips are synchronized to the speech and look much better than most Flash movies or video games. You can change the head via a large library available from the publisher. You can also change the head on the fly during a chat session.

This is where the features list ends. IMpersona doesn't work its magic in MSN chat rooms, where most folks do most of their chatting. There are no file transfer features, scheduling, e-mail linking, or voice over IP. Instant messaging is all there is.

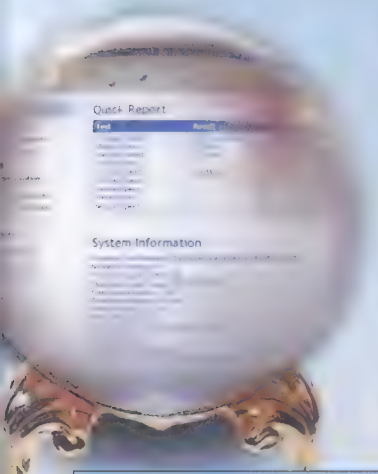
Though my beta was stable, there's a fairly long glitch list in the Readme file that's worth reviewing before installing the program. IMpersona requires quite a few Microsoft modules to run, including a Visual Basic runtime, MSN Messenger, and the Microsoft Text-To-Voice libraries; some are installed automatically, while others require a manual download and installation.

If you instant message frequently with MSN, IMpersona is worth checking out as a novelty at least and a cool new chatting method at best.



Official product name: IMpersona
Version # previewed: 1.3 beta
Publisher: famous3D
Developer and URL: famous3D; www.famous3d.com
Product URL: www.impersona.com/index.html
ETA: Q2 2002
Why you should care: Put a face and voice to your IMing.

Dacris Benchmarks 4.9 Beta



Before Win95, techies knew a handful of benchmarks inside and out that produced simple, one-number results to describe a system's speed pretty well, and the results only took a few seconds to generate. Simple, quick Windows-benchmark programs are now pretty rare.

Dacris Benchmarks feels like those old benchmarks. The results aren't extremely detailed nor use real-life apps, but they are in plain English. The tests are quick, cover major systems, and are (mostly) reproducible.

DB benchmarks the processor, memory, hard drive, CD/DVD, 2-D video, 3-D video, and Internet printer and network speeds. In my tests, only the hard drive benchmark didn't generate results within 1% of each other after several tests. The memory benchmark tested within 2% of results using SiSoft Sandra, which is good.

After testing, DB offers several ways to speed up a system, including increasing Windows' internal caches, removing common splash screens, and manipulating the TCP/IP RWIN packet sizes. These tricks work, but the results aren't terribly earth-shattering in most cases and other free programs essentially do the same thing.

Old DB versions were plagued with crashes and reports of users' systems being corrupted. I found no such problems. The first item on the Readme's list of improvements is increased reliability. So far, so good.

Official product name: Dacris Benchmarks
Version # previewed: 4.9 Beta
Publisher: Dacris Software
Developer and URL: Dacris Software; www.dacris.com
Product URL: www.dacris.com/news_int.html#download
ETA: Q1 2002
Why you should care: Quick and simple benchmarks are few and far between; Dacris speeds up testing system mods.

Infinite Loop

Battle Of The Sexes: Barbie vs. G.I. Joe

It's hard to say whether the pink or the camouflaged plastic personality would win in a sandbox battle. On eBay, however, Barbie easily rises above G.I. Joe.

The Challenger	Auctioned Item	Starting Price	Current Price	Bids	The Winner
G.I. Joe	G.I. Joe "Storm Shadow" figure	$179.99	$179.99	1	Barbie by $2,820
Barbie	#2 Blonde Barbie figure	$500	$2,999.99	6	and 5 bids
G.I. Joe	G.I. Joe figure 1964	$9.99	$50	13	Barbie by $710.09,
Barbie	Brunette Barbie #1 head, #2 body	99 cents	$760.09	13	tie on bids

War FTP 1.80b5

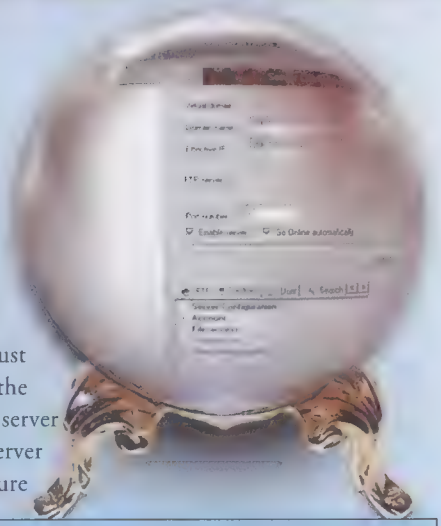
One of the Internet's oldest services is FTP. One of Windows' oldest Internet servers is War FTP, which has always been free. The program's developer is happy to explain why at his Web site. The author is also refreshingly candid about false starts and bad ideas regarding new versions, which is why the venerable program is still in the 1.xx version generation.

The current stable version follows the 1.6x version track, which confusingly has its own beta version, while the main beta track (with new features) is referred to as the 1.7x series. The most recent, however, is confusingly called 1.80b5. If you can sort through the madness, you'll find the most elegant, cheapest, and stable FTP server for a Windows machine around.

While most Windows FTP servers use complicated INI files or a Web page interface for configuration matters, War FTP uses a bona-fide Windows front end. Though this matters little for basic setup issues, the moment you start managing hundreds of users and thousands of files and directories you'll love War FTP's BBS-like user management and user rights screens.

The 1.7x beta track differs from the existing 1.6x track in two aspects. First, 1.6 has all FTP features completely implemented, while 1.7x lacks a few advanced features. The most important difference, however, is that the configuration front end and server daemon are separate programs in 1.7x. This allows for easy remote configuration with 1.7x; you just install the setup/configuration module on the Windows machine you want and leave the server computer alone. In the future, the client/server connection takes place over an HTTP (secure socket) connection, so any old Web browser will work for configuration duties in a pinch.

Though I think the 1.6x interface is superior, I'm apparently in the minority as 1.7x is far more popular. Either way, the few security holes and bugs that have been found have historically been quickly patched, and performance is top-notch. ▲



Official product name: War FTP
Version # previewed: 1.80b5
Publisher: jgaa Internet
Developer and URL: jgaa Internet; www.jgaa.com
Product URL: www.jgaa.com/software/warftpd/index.htm
ETA: Q1 2002
Why you should care: If you need an FTP server, look no further.

MAME 0.57

Most games in beta are new, but not MAME (Multiple Arcade Machine Emulator). In fact, the games MAME plays are about the oldest computer games in existence. MAME amazingly is able to faithfully emulate nearly all the old games you played in the arcades. It can emulate many new games, too, but you may have to work at it a bit.

MAME has been around for a few years, and with each new beta version, more games and Windows-based hardware are supported. With beta 0.57, the number grows to 1,843 supported, unique games.

Of course, MAME doesn't come with all these games built-in. Instead, MAME reads the ROM files from a game and acts as the original hardware that ran the game code, right down to emulating the DIP switches to change the game's settings. The ROM files can be a trick to locate, but searching for "MAME ROMS" on any major search engine should direct you to the sites you need. The MAME site also has a link page to get you started.

How well does MAME work? Surprisingly well after you read the documentation. The Windows version still uses command line switches run in a DOS window (or equivalent in XP and NT). You need to name various ROM and Sample files a certain way and put them in certain directories, but once you sort through the rules and download the ROMS, games usually work beautifully. If they don't, report the problem and await the next beta. There are usually a few betas a year.

Speed can be an issue. It isn't emulating a 1MHz 8088 CPU that's the trick, but all of the supporting sound hardware and chips that made these old games tick. A 500MHz CPU should do for most games, but some were slow on a CPU less than a 1GHz. Crashes weren't a problem. If you've been dreaming of old games, download MAME and some ROMS as fast as you can. ▲

Official Product Name: MAME: Multiple Arcade Machine Emulator
Version # Previewed: 0.57
Publisher: The MAME Team
Developer and URL: The MAME Team; www.mame.net
Product URL: www.mame.net
ETA: Now
Why you should care: Accurate, classic arcade gaming on your PC is always worthwhile.

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go around. Send your prospects to bleedingedge@cpumag.com.

Pocket PC 2002 vs. Palm OS 4.1

You've seen the sultry ads from Palm and the quips from Microsoft asking, "Can your Palm do that?" The debate between Palm and Pocket PC isn't being waged just between marketing departments; it also rages in newsgroups and online communities. Like Mac vs. Windows debates, Palm vs. Pocket PC is shaping up as quite a war of words. We'll push our way in, separate the two sides, and determine what each platform offers.

Microsoft's latest offering is dubbed Pocket PC 2002 (www.pocketpc.com). Like the original Pocket PC platform, Pocket PC 2002 has Windows CE 3.0 at its core. The primary additions to the platform are small changes to the interface and new networking applications for business users.

Interface. Microsoft designed the Pocket PC interface to be as close as possible to a PC. In fact, Pocket PC 2002's new look closely resembles Windows XP. Like using a Windows' PC, you'll find applications in the Start menu. You choose which applications appear here. You access other applications by tapping Programs.

Pocket PC 2002's Today screen lists the day's appointments and tasks. You can customize the look and the type of information to display in Today.

Overall, Palm's application launcher is more convenient for launching portable programs, although we do like Pocket PC's Today feature, which lists the highlights of your day, including upcoming appointments and tasks.

The new Pocket PC interface is widely unchanged from the original interface. One minor addition to it is an *X* in the upper-right corner that lets you quickly close applications. Before Pocket PC 2002, it could take up to six taps to close an application.

Applications. Pocket PC 2002 includes the Pocket Outlook applications we've seen since Windows CE 2.0. Calendar, Tasks, Contacts, Notes, and Inbox are separate applications, but they're collectively referred to as Pocket Outlook. Other familiar applications include Pocket Word, Pocket Excel, and Microsoft Reader.

Windows Media Player is also back. In addition to audio files, this pint-sized media player can play local or streaming video clips. Pocket PC devices can support CompactFlash and Secure Digital removable media for extended storage of software and files.

Pocket PC 2002 includes a number of new apps. With a wireless Internet connection, you can instant message using MSN Messenger. Other new communication tools focus on businesses and large organizations. A VPN client lets you securely connect to private networks to retrieve files, e-mail, and other information. In addition, the Terminal Services Client lets you connect and manage your Web servers remotely. The Connection Manager tracks the ways you connect to different networks and automatically selects the best available option.

Battery life. Some users would argue that battery life is more of a hardware issue and not suited for a software discussion. We disagree. Many applications in the Pocket PC platform directly affect battery life. Windows Media Player is just one example. Decoding compressed music files and pumping out sound to headphones place significant demands on the battery. These battery concerns must temper any enthusiasm over Pocket PC's multimedia capabilities.

We loaded an MP3 file into a Cassiopeia E-200 and set Windows Media Player to continually loop the song. Even with the display off, the battery only held out for about 5.5 hours, compared to the 12 hours of battery life listed in the system specs.

Multitasking. To really run down battery power in a hurry, try listening to music while

Windows Media Player can play audio and video files on your Pocket PC.

playing ZIOGolf 2. Because the Pocket PC provides a multitasking environment, this kind of battery kamikaze is possible. However, it's nice if the music doesn't die when you're looking up an appointment.

As mobile devices converge, we are likely to see an even greater advantage to multitasking. For example, we've seen demonstrations of a Pocket PC cell phone from HTC, the same company that designed the popular iPAQ Pocket PC. The phone uses GSM for voice and GPRS for data. With its multitasking capabilities, it is possible to talk on the phone with one friend while sending an instant message to another. The more things you want to do in the background, such as carry on a conversation or listen to music, the more appealing the Pocket PC's multitasking capabilities become.

ActiveSync. Perhaps no portion of the Pocket PC puzzle has improved as much as Microsoft's synchronization software. Early versions, known as Windows CE Services,

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

included an asinine bug that conflicted with dial-up networking, making it impossible to connect with your PDA after using your modem and vice versa.

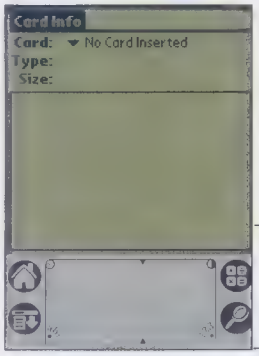
The current sync software, known as ActiveSync, starts immediately after you put your Pocket PC in its cradle. Information on your desktop immediately updates on your Pocket PC. ActiveSync integrates tightly with Windows, letting you browse your PDA's files in My Computer or drag and drop files between the desktop and your PDA.

Final word. There's little doubt that the Pocket PC offers more advanced software. With improving hardware, Pocket PCs are becoming slimmer and more attractive than ever. Still, battery life is a concern because the features that are so attractive are so power-reckless. Frequent travelers will want to pack the AC adapter.

Palm OS 4.1

Palm OS 4.1 (www.palm.com/software) is primarily a bug-fix release, so there are few meaningful changes between it and Palm OS 4.0. Palm OS 4.0 added Palm's VFS (Virtual File System) for addressing files on removable SD cards and basic Bluetooth support. Although the Palm OS lacks the multimedia capabilities of the Pocket PC, it's still a remarkable and versatile tool.

Interface. The Palm OS features a much simpler interface than Pocket PC. There isn't a Today screen, but the Palm OS app launcher lists programs installed on your PDA. To help organize your applications, you can place programs in different categories and choose to view only programs within a certain category. When it comes to organizing, finding, and launching applications, I prefer the Palm OS interface.



The addition of Card Info to Palm OS 4.0 lets you manage content stored on SD and MMC media.

Applications. Since the days of the Palm Pilot 1000, five applications have been at the core of the Palm OS: Address, Date Book, E-mail, Memo Pad, and To Do List. These applications manage most personal information and correspond to the Pocket Outlook applications included with the Pocket PC.

Palm doesn't have its own software for reading and editing desktop documents, but it does distribute DataViz's (www.dataviz.com) Documents To Go with the Palm m125, m500, and m505. Documents To Go lets you sync Word and Excel documents with your Palm. HandEra distributes Cutting Edge Software's (www.cesinc.com) Quickoffice with its PDAs.

Newer Palm hardware includes Palm's Mobile Connectivity software, which lets you connect to the Internet using a cellular phone. Software for checking e-mail and surfing the Web is included. The software bundles with the Palm m125, m500, and m505 but isn't officially part of the OS.

The Palm OS application launcher is clean and simple. You can organize applications according to specific categories.

Battery life. Again, we must examine the software's impact on battery life. With few Palm units supporting video or audio playback, battery life is typically much better on Palm devices. Some grayscale Palm OS devices (such as Handspring's Visor Neo) can run more than a month on two AAA batteries. Rechargeable Palm devices can go several weeks without a charge.

Multitasking. Unlike the Pocket PC, the Palm OS doesn't officially support multitasking. There are, however, ways to work around the OS. For instance, the Sony CLIE PEG-N710C uses a dedicated processor for decoding MP3 files. This means you can listen to music while going about your business.

HotSync. HotSync has long been a reliable and stable way to synchronize information between a Palm device and your desktop computer. Unlike ActiveSync, the process isn't automatic, but we don't mind the extra labor.

HotSync communicates with a variety of desktop PIM applications. While Pocket PC 2002 users are tied to Outlook, HotSync users can communicate with virtually any desktop PIM using conduits. Macintosh versions of HotSync and Palm Desktop (the desktop PIM all Palm OS devices bundle) mean the Palm OS doesn't exclude Mac users. Linux coders have written applications to synchronize a Palm, although Linux isn't officially supported.

Final word. Palm often refers to the Zen of Palm. At a time when Windows CE devices were big and bulky, the idea was appealing. With new hardware advances, however, the Palm OS is beginning to look a bit underpowered. We're not asking for wholesale radical changes, we'd just like to see the incorporation of some features licensees have already added. Higher resolution displays, for instance, would be a nice start. Support for more RAM would be another step in the right direction. Still, the Palm OS is the standard and for good reason.

Tale Of The Tape

In the end, the Pocket PC 2002 platform has a slight advantage primarily because of the bundled software it includes. Pocket Word and Pocket Excel give business users more flexibility to get their work done and IT personnel will love the VPN and Terminal Services clients.

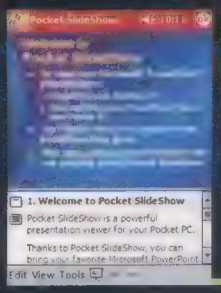
That's not to say the Palm OS doesn't still have a lot to offer users. The more practical among us are still likely to opt for the less expensive Palm OS platform. However, with major changes on the way at Palm, the recent acquisition of Be, and support for more powerful processors on the way, the Palm OS may close the short gap between itself and Pocket PC in the near future. CPU

by Chad Denton

For a comparison chart of Pocket PC 2002 and Palm OS 4.1, go to www.smartcomputing.com/cpumag/march02/pocketpalm.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Cool Apps For Pocket PC



Pocket SlideShow

Pocket SlideShow ($19.95; www.cnetx.com) lets you view and edit PowerPoint 97/2000/XP presentations on your Pocket PC. Simply drag and drop a presentation into your Pocket PC and it automatically converts to Pocket SlideShow format.

Pocket SlideShow lets you import PowerPoint presentations to your Pocket PC and edit presentations on the go.

Pocket Controller 2.01

Pocket Controller ($19.99 Standard, $24.99 Professional; www.soti.net) lets you run your Pocket PC from your desktop. Connect your Pocket PC to your desktop and use Pocket Controller to enter text, grab a screenshot, or view important system information about your Pocket PC.

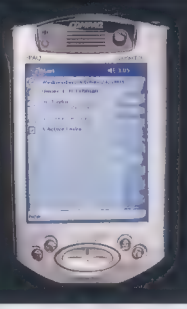
Pocket Quake

This is a free port of the classic first-person shooter Quake. There is no installation program, so you need to gather the necessary files and install the game manually. Find instructions and files at quake.pocketmatrix.com/quake/index.html. At press time, a port of Quake II was in development.

Cool Hardware

Compaq iPAQ 3835

A 206MHz StrongARM processor and 64MB of RAM provide plenty of performance for the Compaq iPAQ. A 16-bit reflective TFT display, integrated SD slot, and Pocket PC 2002 software complete the package. The iPAQ 3835 ($599; www.compaq.com) is sleek and sexy. Its silver finish and small, light design makes it a truly stunning Pocket PC. The new iPAQ is compatible with existing hardware expansion sleeves for older iPAQs. By clipping the proper sleeve, you can utilize CompactFlash cards, PC Cards, and other hardware.



Handspring Treo 180

The convergence between cell phones and PDAs is beginning. Handspring's Treo 180 ($399; www.handspring.com) is a mobile communicator/PDA running the Palm OS. Basic Palm OS apps are included, but the Treo also lets you send and receive data or place phone calls from the device. Two models, the 180 and 180g, are available. The 180 includes a small keyboard while the 180g favors the use of Graffiti. The 180 has a grayscale display. The Treo 270, available in mid-2002, and will feature a color display. Both phones will run on GSM networks.

Cool Apps For Palm OS

SilverScreen 2.3

SilverScreen ($19.95; www.pocketsensei.com) augments the Palm OS application launcher. SilverScreen not only lets you customize your application launcher, it also lets you quickly get information about an application, access popular features, and quickly run recently used applications.

SilverScreen for the Palm OS lets you customize the look and feel of your Palm interface.

JackFlash 2.3

Some Palm OS devices use flash memory so users can update the OS. Typically there's space in flash memory left over. JackFlash ($19.95; www.brayder.com) lets you use this space to save applications and personal data to expand available memory and keep data in flash memory safe from hard resets and drained batteries.

SimCity For Palm

You'll want a Palm with a color display for this PC classic available for Palm OS devices ($29.95; www.ateliersoftware.com/palm). You can build your own city and try to keep up as people flock to it. Keep the books balanced, traffic flowing, and electricity on and you'll win the adoration of your citizens.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Jerry Hatchett

OnTrack SystemSuite 4.0

SystemSuite 4.0
$59.95; $53.95 download
OnTrack
www.ontrack.com

CPU CPU CPU CPU

SystemSuite 4.0 is designed to keep your machine running smoothly, safely, and efficiently. It includes a robust antivirus utility, drive maintenance tools, diagnostic problem finders, a software firewall, and more.

I put SystemSuite through its paces on three test machines, including a loaded Pentium 4, an old Pentium II clunker, and a Celeron-charged notebook. All three test machines were outfitted with Windows XP Professional. Installation of SystemSuite was painless on all three machines, though a bit slow (not surprisingly) on the PII. Once installed, the software ran without a glitch on each machine.

The suite's VirusScanner Pro utility can keep an eye on every file coming into your computer or watch for only specific activities you define, such as e-mail attachments. The utility checks for and retrieves updates to its signature files on a regular basis. VirusScanner Pro retrieved an update virtually every day after I installed it. At first I had all the features fully enabled, keeping a constant vigil on all the inbound traffic. This was the surest way to stay free of infections, but the overhead was too much to bear. All three machines slowed down considerably with this configuration. Changing to the Auto Email Scan setting and scheduling a daily scan of the entire system alleviated the problem while maintaining a comfortable level of security.

SystemSuite's All In One feature gave me my only real problem. This virtual gizmo goes through your machine making its own decisions on what needs fixing and rearranging. However, it made some poor decisions with regard to some Registry edits on one machine that took about an hour to straighten out. The problem originated from the machine having Office XP and remnants of Office 2000 present. In any event, take caution using the feature.

Drive maintenance in SystemSuite is first class. The software does a great job of setting up zones on a hard drive during defragmentation and dropping files into the appropriate zone depending on how frequently they are used. Often-used files are placed in a zone adjacent to a buffer area of extra space that's set aside for the growth of these files. By using this expansion zone, files can grow without instant refragmentation caused by writing new chunks of the file halfway across the drive. This technique worked out well, and I saw a noticeable speed improvement over Windows' defrag utility. In addition, SystemSuite's DiskFixer module found and fixed drive errors that other utilities missed.

Drive maintenance in SystemSuite is first class. The software does a great job of setting up zones on a hard drive during defragmentation and dropping files into the appropriate zone depending on how frequently they are used.

The Recovery module in SystemSuite includes several tools that can help prevent losing data, as well as tools to recover data when problems do occur. These tools include SystemSaver, which backs up critical system files; DiskSnapshot, an undelete utility; and EasyRecovery Professional Lite, a proprietary tool that lets you recover up to 50 damaged files. An unlimited version of this utility is available at an extra cost, plus OnTrack also offers advanced data recovery services via remote access to your computer or by sending your hard drive to OnTrack's lab, which can be a little expensive.

Tucked inside the SystemSuite Uninstall module is a plethora of handy utilities. The Transport feature will package an application with all the needed files and reinstall it on another machine. A similar Move applet lets you move an application to another location on the same computer. Other notable tools in this section include a nice uninstall feature that does a good job of removing an application and tidying up afterward, along with an application backup tool.

There isn't enough room here to fully dive in and detail all the features in SystemSuite, including the sturdy firewall, compression utility, DataEraser utility that *really* gets rid of files permanently, gorgeous and friendly GUI, and lots of other bells and whistles.

As a bonus, the retail version of SystemSuite comes with an Explorer-like program called PowerDesk 4 Pro that is darn near worth the purchase price of the suite alone. PowerDesk 4 Pro is one of the easiest-to-use FTP programs you could hope to find. Combined, SystemSuite 4.0 is very impressive and well worth considering.

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

by Jerry Hatchett

Zone Labs ZoneAlarm Pro 2.6

As more users transition from dial-up to always-on broadband connections, the need for security against crackers increases. ZoneAlarm Pro 2.6 aims to provide that security via a software firewall.

Upon installation, ZoneAlarm is very talkative. Each time an application tries to access your local network or the Internet, a dialog box asks you to grant permission. For common applications, such as Web browsers, you can configure ZoneAlarm to trust the app without asking again. Within an hour of installation and subsequent normal usage, the dialog boxes became infrequent as ZoneAlarm remembered my decisions. You can change the permissions at any time, and the process is elegant and easy. A program list lets you simply check and uncheck the trust level for each app independently for local or online access.

If your computer acts as a server or Internet gateway for a local network, ZoneAlarm monitors requests from other network computers and lets you grant or deny permissions. You can also create trusted zones on a local network; you can give computers within a trusted zone carte blanche or restrict access to the network and Internet.

In addition to monitoring internal requests, the firewall constantly watches for suspicious incoming traffic and instantly alerts you when a suspected attack occurs. Any incoming request for access to your machine is denied by default unless you grant permission. If an attack occurs, one click takes you to the Zone Labs' site for an explanation of the risks of that particular attack.

ZoneAlarm's design and layout are as intuitive as I've seen in a long time. I navigated with ease, rarely needing to click for help. More important, the app stopped would-be attackers in their slimy tracks. The Pro version is $39.95, but there's also a free version for stand-alone personal machines. Version 3.0 is expected to be available as you read this.

ZoneAlarm Pro 2.6
$39.95
Zone Labs
www.zonelabs.com

BlackICE Defender 2.9

BlackICE Defender is a software firewall and intrusion-detection utility that has a solid history and proven record of providing simple, safe protection.

Installations were quick and painless on my test machines: a Pentium 4 with 640MB of RDRAM and a Celeron notebook with 196MB of SDRAM, both running Windows XP Professional. Installation was so quick and simple I thought it had failed until I noticed the BlackICE icon in the System Tray.

The simplicity continued after installation. No configuration was necessary to engage BlackICE's protective shield. It instantly started detecting and blocking attempted intrusions. Attempted intrusions are classified into three levels of severity, and you can instruct the software to alert you visually and/or audibly at a severity threshold of your choosing.

BlackICE builds easy-to-understand lists of blocked Events and Intruders, which you can select for more details. Right-clicking an intruder's entry gives you options to trust or block the intruder once or forever.

The software did an admirable job of sniffing out and stopping many attempted intrusions on the test systems, including a flood of attacks originating in Asia. The app isn't as configurable as some firewall software, but its automatic differentiation of suspicious activity vs. legitimate requests was impressive.

This automatic environment does have the minor shortcoming of not offering the same control over how individual apps access a local network and the Internet that other firewall packages do. For example, Gator is handy, but it can also be a royal pain with its incessant ads popping up based on the Web content you're viewing. If BlackICE had individual application control, you could retain the automatic login capability of Gator while blocking access to its invasive ad server.

Overall, BlackICE Defender is solid and offers good protection against online intruders. A new version that's reportedly around the corner is expected to offer new features and enhanced protection for home and office computers.

BlackICE Defender 2.9
$39.95
Internet Security Systems
www.networkice.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Kevin Savetz

MusicMatch Jukebox 7.0

MusicMatch Jukebox 7.0
$19.99
MusicMatch
www.musicmatch.com

Using MusicMatch Jukebox 7.0 is a little like voting for Ralph Nader. It seems like a pretty good idea, but in reality, it's fraught with some problems. The MusicMatch Jukebox software lets you listen to CDs, rip and listen to MP3s, burn audio CDs, and tune in to Internet radio stations. But some basic functions simply don't work very well.

There are two versions of the program. The free version offers basic playing, ripping, and burning. The $19.99 registered version adds equalizer functions, CD label printing, and support for digital audio effects.

Jukebox can rip from CDs or grab audio from your PC's line-in port, converting your music to MP3, WAV, or Windows Media formats. On our test system, the program's MP3 ripper was agonizingly slow, taking twice as long to rip a song as to simply play it.

Even after you pony up 20 bucks for the software, you sometimes feel as though the company is always begging for more. For example, the software is compatible with sound-enhancement plug-ins, but it doesn't come with any. You can, however, buy an effects plug-in for another $19.99.

Jukebox plays Internet radio stations, but it'll constantly badger you to subscribe to the Radio MX service for $4.95 a month or $39.95 a year. The service is cool, offering stutter-free MP3s and customized playlists, but oh, the nagging. You can listen to free streaming radio stations, too, and there's a built-in program guide. However, most of these free stations wouldn't play on our test system, serving up an obtuse error message instead. The support team provided a fix involving a trip into the Registry Editor that solved the problem.

Jukebox serves up other features, including skins, visualizations, and the ability to print CD labels, but these are just icing on a bland cake.

Nullsoft Winamp 2.78

Winamp 2.78
Free
Nullsoft
www.winamp.com

If you need a program to listen to digital music with, you don't need to look any further than Winamp 2.78. The program is a snazzy player that delivers you tunes from your audio CDs, MP3s, and online streaming radio stations. Winamp is strictly an audio player, though; it won't give you the ability to rip MP3s or burn audio CDs.

Nullsoft serves up Winamp in three free versions. The no-frills Lite version of the program plays MP3s and Internet streaming stations. The Standard version adds support for visualizations to accompany the music playing, and the Full version adds support for Windows Media Audio. These choices let you balance features with bulk: The Lite version weighs in at 500KB, while the Full version is just less than 2MB in size.

The program is sleek and efficient; it doesn't waste screen real estate, although some people might argue the interface is too compact and the buttons too small. If your eyes aren't what they used to be, you can double the size of the main display windows. If you'd rather not deal with Winamp's interface at all, you can still access the most important functions from the System Tray.

Winamp also includes a minibrowser, which essentially amounts to a simple Web browser. The minibrowser can automatically show you links embedded in MP3 files and ShoutCast streams, which is an interesting way to get more information about the artists you are listening to. You will also use the minibrowser to tune into streaming Internet radio stations. The browser takes you to Nullsoft's free Shoutcast.com streaming audio system, which is one of the more comprehensive directories of streaming radio stations around.

No audio player would really be complete without a few goofy features to tinker with, and Winamp has its share. These include various skins, visualizations, and support for sound-manipulation plug-ins. You can choose from a ton of skins and plug-ins from the archive available at the Winamp Web site.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Instant Messaging Showdown

There are a lot of instant messaging apps out there and a lot of people using them. Here's a look at how a handful of the more notable IM apps stack up.

Yahoo! Messenger 5.0

Yahoo!'s entry into the instant messaging realm is simply called Yahoo! Messenger. It's a joy to use: simple, reliable, and stable. You can use it for private messages, private multiperson conferences, and public chat rooms.

Besides basic text messages, Yahoo! Messenger supports voice chat and Web conferencing. You can even set up a group voice conference or videoconference. You can also send files directly to chat buddies. A shared whiteboard is the only tool the program lacks for serious online collaboration.

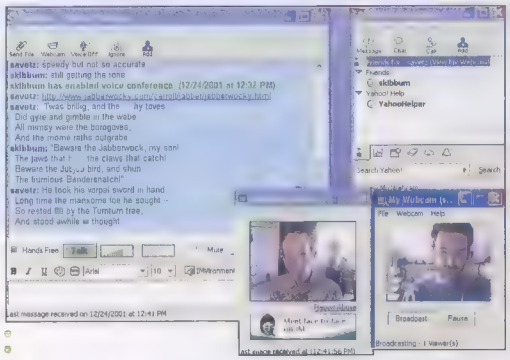
If you're interested in public chat rooms, you can create a profile and explore hundreds of Yahoo!'s chat rooms. Like private IMs, chat rooms can include voice and video. A full complement of privacy preferences lets you keep strangers in their places.

Yahoo! Messenger versions are available for Windows, Macintosh, FreeBSD, Linux, Palm OS, and Windows CE, so you should be able to talk to all of your online friends. There's also a version for some mobile phones and a Java version that works with other platforms or when you're using a public computer where you can't install the full client.

Messenger 5 adds a useless but fun feature called IMVironments, which are background themes, such as an animated fish tank, that appear in instant message windows. Yahoo! offers a library of these themes, which you can download and install in two seconds.

When you're not being deluged with messages from friends, the program can serve up personalized information, including stock quotes, a calendar, news, and local weather. The program integrates with your My Yahoo! account for these features. For instance, you can keep tabs on your Yahoo! Auctions bids, or if you've entered your stocks at finance.yahoo.com, you can track them within Messenger.

Yahoo! Messenger is intuitive to use (even for voice conferencing and videoconferencing) and offers the right balance of useful and fun features.



Yahoo! Messenger 5.0
Yahoo!
messenger.yahoo.com

AOL Instant Messenger 4.7

AOL Instant Messenger, known as AIM to its legions of users, is a sleek and satisfying messaging system. It's among the easiest to use and is one of the more stable IM applications around, but it's not the most feature-packed.

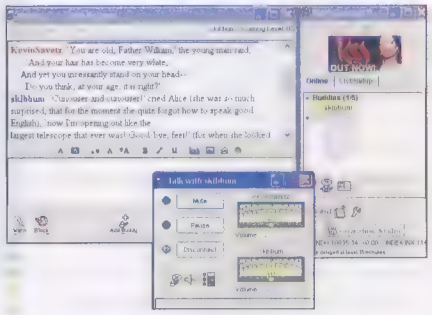
The program includes PC-to-PC voice chat, but you can only use the voice chat feature for one-on-one conversations. There's no group audio chat, as with Yahoo! Messenger. Although AIM's sound quality is good, the voice chat lacks push-to-talk functionality, which can be inconvenient. AIM doesn't do video chat, but you can send and receive files to and from other users. There's also a game function that lets you play multiplayer games with your buddies, but you must be on the same local network to do so.

If you're looking for new friends, you'll find a smattering of public chat rooms, but you're restricted to typing because the voice chat feature doesn't work in those public chat areas.

You don't need an AOL account to use AIM. If you use AOL, AIM's features are built into AOL. If you're not an AOL member, AIM is the easiest way to chat with friends who are members. If you already have an account with an AOL property, such as Netscape, CompuServe 2000, AOL Hometown, or AOL.com's Personal Finance center, you can use that account on AIM. That makes for one less password to remember.

There are versions of AIM for Windows, Macintosh, Linux, Palm, and Windows CE. A Java version called AIM Express lets you send instant messages without installing the full-blown client, and AIM Wireless lets you send and receive messages with a cellular phone. There's also a Netscape-branded version of AIM called Netscape Instant Messenger, which is virtually identical.

AIM isn't cluttered with many extraneous features, but there are a few outside the primary purview of instant messages and chat. The stock and news tickers serve up scrolling headlines, and the AIM Today page offers local weather and features, such as a horoscope and joke of the day. The Mail Alert feature can periodically



AOL Instant Messenger 4.7
AOL
www.aim.com

CPU Ranking: 0 = Absolutely Worthless ... 2.5 = Absolutely Average ... 5 = Absolutely Perfect

check your POP e-mailboxes and alert you when you have new mail.

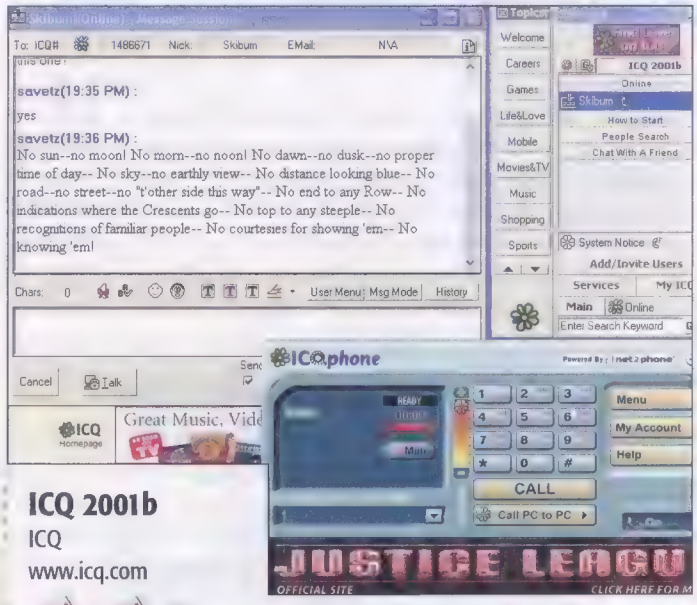
ICQ 2001b

ICQ is one of the oldest IM programs and a perfect example of a phenomenon known as "creeping featurism." In short, ICQ tries to do too many things, and as a result, it manages to do few of them well. The interface is a maze of buttons and windows that has grown into an unintuitive mess.

If you're willing to endure the interface, you will find advanced features and plenty of modes of communication. These include the ability to send alphanumeric pages and receive SMS messages to and from mobile phones. There's also a PC-to-phone feature for making inexpensive long-distance calls to standard telephones and a free PC-to-PC chat feature (which we couldn't get to work). The program also offers private text messages, private group chat, and public chat rooms. After installing external software, you can play multiplayer games, including canasta and Quake, with your pals.

ICQ puts special emphasis on its community features, including a directory for finding people who share your interests. Many of the community features are Web-based and exist outside of the application, such as personal Web sites, Web rings, and a white pages tool. The program also includes e-mail support. You can send and receive e-mail messages from within ICQ and get a free Web-based e-mail account through the site. A greeting card feature lets you send Web greetings to your chat pals.

ICQ is available for Windows, Macintosh, Windows CE, Palm OS, and Java. ICQ is a certainly a powerful messaging application, but be prepared to spend a lot of time exploring this messenger to find the features scattered throughout.



ICQ 2001b
ICQ
www.icq.com

MSN Messenger 4.6/Windows Messenger 4.5

Microsoft brings two instant messaging applications to the table: MSN Messenger and Windows Messenger. At first glance, the two are similar, but they are just incompatible enough to make you a little crazy. MSN Messenger will work with Windows 95/98/Me/2000/NT. Windows Messenger is built into XP and only works (for now) with that operating system.

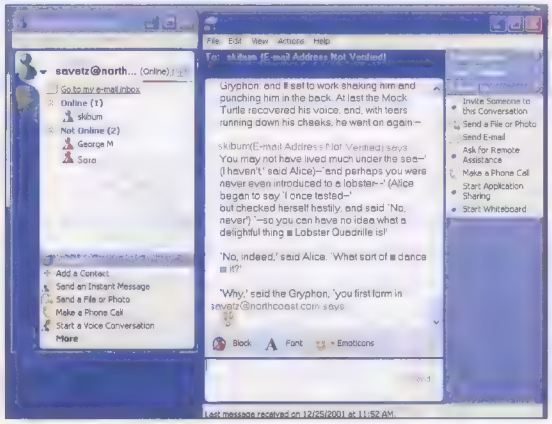
For just basic text messages between two or more people, the programs are compatible and work well. Beyond that, your mileage may vary.

The list of the programs' advanced features is impressive. They include audio and video chat, a whiteboard, and application sharing. But you may quickly find out there are hurdles to using those features. The audio, video, and whiteboard functions won't work if one of the users is behind a firewall. Other features include the ability to place inexpensive PC-to-phone calls and the ability to send files directly to your chat buddies, neither of which work if either user is behind a firewall.

Video chat doesn't work at all with MSN Messenger; it only works among XP users using Windows Messenger. More often than not, we were stuck with low-tech text-based instant messages.

You can find new friends in public chat rooms with MSN Messenger. Inexplicably, Windows Messenger doesn't support public chat rooms and offers no way to search for people based on common interests or any criteria except by name. Windows Messenger does support WinXP's .NET Passport feature but puts it to such dubious use you'll wonder why they bothered. From within Windows Messenger, you can receive .NET Alerts, shop for music, get fares for airline tickets, and do other tasks that belong in a Web browser.

These instant messaging tools are the least cross-platform friendly, as versions of MSN Messenger are only available for Windows, MacOS, and Pocket PCs. CPU



MSN Messenger 4.6 and Windows Messenger 4.5
Microsoft
messenger.msn.com

by Kevin Savetz

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Chris Pirillo

Carrying More Than A Tune

Chris Pirillo is a geek in every sense of the word. When he's not distributing technology tidbits on Lockergnome (www.lockergnome.com), he's hosting "Call for Help" (www.callforhelp.tv) on TechTV. Chris is also a motivational speaker; he drinks coffee to slow down. He enjoys digital photography, designing Web sites, and walks on the beach.

I usually talk about software here, but this month I need to rant about hardware. I wanna buy a laptop, but the process has been like navigating a minefield. Each unit (or company) I've considered has a glaring shortcoming. I've owned a notebook or two before; I know what I want in a new one: a large screen, a Tualatin core, and proven reliability. More importantly, I know what I don't want. This unfortunately narrows the field considerably.

I know what you're thinking. "Get the Dell!" No way. I don't care if it has an NVIDIA chipset; Dell's high-end Inspirons currently run on a desktop chipset. For a laptop, that's the epitome of dumb. It not only lacks proper power management but this (assumed oversight) also gives rise to horrible heat issues. I walked into the lab the other day and witnessed one running through a hard disk defrag. Out of curiosity, I put my hand over the vent. Ouch! Couple this with other laptop hardware and support issues and it's obvious why people are starting to think twice about supporting Michael's little company.

This time Mr. Lethargy greeted me. From "Hello," it became increasingly uncomfortable. The rep seemed standoffish; he wasn't listening to me.

It's no secret that Dell's customer service and tech support have been steadily sliding downhill the past few years. This is, quite frankly, disconcerting. Poor experiences with Gateway reps ruled them out. Complaints from Gnomes about how Sony handled laptop repairs stopped me from considering a portable VAIO. I've heard great things about the IBM ThinkPad, so I swung by the site for details. Looks like someone forgot to implement the Windows key in their T-series. I use it all the time to view the Desktop (WIN+D), launch Run (WIN+R), open a Search window (WIN+F), etc. Sure, I could remap an unused function key, but I can't get over the S3 video chipset the system relies on. Ugh.

Toshiba? From what Lockergnome subscribers tell me, its Tecra 9000 models are something to behold. Or, held . . . as the case would be. Let's configure one, shall we? After two weeks of trying, I've been met with the same stupid error: "Could not connect to JRun Connector Proxy. Please contact the system administrator for this web site." If I reported every error I spotted, I'd never get anything done. Though I can't help but wonder how many more sales will be lost due to this bug? And don't think Toshiba is the only one with an unusable Web configurator. HP isn't far behind, although it's a chassis of a different color. And that's not a good thing.

From my understanding, HP's Pavilion line has had hardware problems across the board. However, many a geek has lauded the Omnibook series. My sights have been on the 6100 for months. I mustered up enough courage to assemble my own unit online. I wanted more memory, a CD-RW /DVD combo unit, and XP Pro. While this series supposedly supports each option, I couldn't tweak them on hp.com (natch). I cold-called a sales rep, thinking I'd have something in my hands by week's end. I was mistaken.

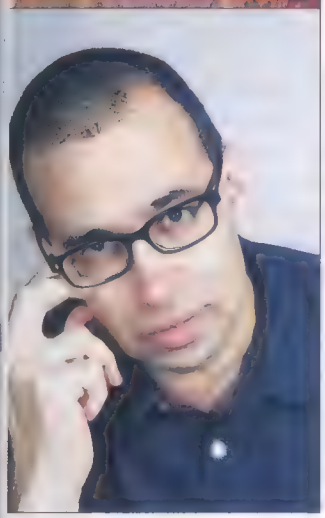
I connected with someone who told me I could not do what I knew I could; she told me I could only get XP with another line of HP laptops. Either she was incorrect or the Web site was misleading. Either way, I waited a few hours and called again. This time Mr. Lethargy greeted me. From "Hello," it became increasingly uncomfortable. The rep seemed standoffish; he wasn't listening to me. Sure, I fired questions left and right, but isn't it his job to get me answers? I gave up and quit the transaction.

Long story short: Marketing departments need to wake up. We're better informed consumers now. We don't walk into a computer superstore and buy the first thing we see. Well, not all of us. Bells and whistles are great, but only if they're playing a melody worth listening to. I'm chained to my desk right now hoping someday soon I'll find a laptop that lets me carry more than a tune. ■

You can dialogue with Chris at chris@cpumag.com.

by Pete Loshin

A License To Code



Pete Loshin, former technical editor of software reviews for BYTE Magazine (print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.

If colleagues raved about a new, better, faster, more reliable, more free OS than yours, you'd rush out and try it, right? Of course not. Me neither. I played with Linux for years before I tossed Windows out the, um, window. But this time I'm not talking about Linux. I'm talking about FreeBSD.

Years before Linus Torvalds began coding his kernel, before Richard Stallman founded the GNU (GNU's Not UNIX) Project and wrote the GPL (General Public License), open source software was floating around for anyone to use—as long as they had a box capable of running UNIX.

Why the academics writing much of this free software used UNIX is a long story, but eventually some folks at UC Berkeley ripped out the proprietary code and put together a free, complete POSIX OS called the Berkeley Software Distribution (BSD), distributing it under (what else?) the BSD license.

The license is liberal: Anyone can use, modify, or distribute source and /or binaries in any way—including sell proprietary mods—provided they include the warranty disclaimer, the copyright notice, and they don't use any names in advertising without permission.

After years of hearing BSD praised to the sky, I downloaded and installed FreeBSD.

But GNU's Stallman believes it immoral to charge software buyers a premium for code they can't fix themselves, can't modify themselves, can't even support themselves when the vendor is no longer able or interested to do so. If the BSD license is liberal, the GPL is radical verging on revolutionary. For Stallman, "free" means using a viral license that ensures the code will always be free. If you modify or adapt a GPL'ed program, you must distribute it under the GPL, thus preventing the source from ever being used for closed software.

Last year when Microsoft's Windows operating system chief Jim Allchin called open source "an intellectual-property destroyer," the uproar was predictable and justified. Microsoft spinmeisters quickly backtracked, claiming Allchin meant just the GPL, not all open source. Strip away the inflammatory rhetoric and Allchin has a point, kind of. The GPL does make it hard to exploit free code, but why shouldn't we be allowed to specify how our code is distributed?

What's interesting about Allchin's comment is that Linux, Microsoft's current identified threat, is distributed under the GPL, while the three major open BSD projects use BSD-style licenses (many commercial *NIXes also have roots in BSD as well, including Sun Solaris, IBM AIX, and HP Ultrix).

Saying NetBSD is optimized for portability, OpenBSD for security, and FreeBSD for stability, is like saying the 1994 McLaren F1 has a higher top speed than the 1995 Ferrari Testarossa Koenig Competition Evolution. They both go fast, and whatever flavor, BSD is stable, secure, and open.

Performance nuances may be invisible to regular folks, but companies running big Web sites can tell the difference, which is why you'll find BSD everywhere from Hotmail (even after Microsoft bought it) to Yahoo!. The price is right; it's like driving a McLaren for the cost of gas and oil.

After years of hearing BSD praised to the sky, I downloaded and installed FreeBSD. Installation was trickier, but I saw no obvious differences between FreeBSD and Linux. Once I logged in and started X, my Desktop looked exactly as it does under Linux.

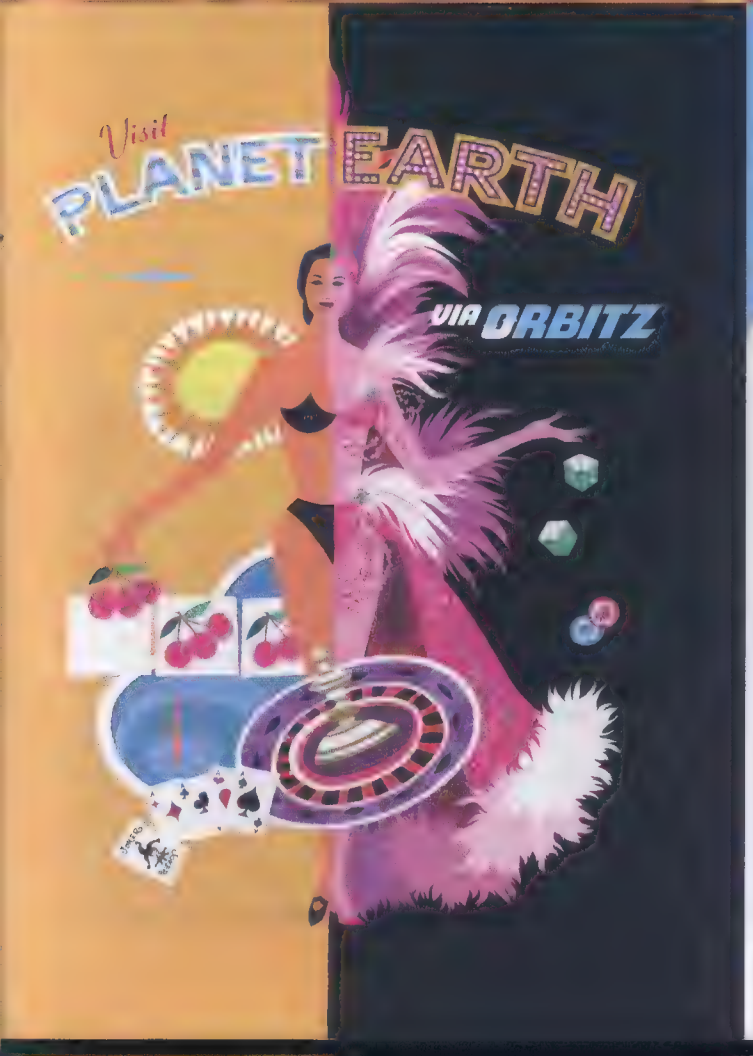
Which is perfect, because it means switching from Linux will be 10 times easier and a hundred times faster than my switch from Windows.

It's fun to speculate about whether Microsoft would release its own Linux distribution, but the GPL probably makes that impossible. But Torvalds first released Linux in 1991, while lawsuits, inertia, and other factors held back development of an i386 architecture version of BSD for about three years.

Given Allchin's comments, one wonders what might have been if Linus were slower or the BSD crowd quicker in getting a free i386 kernel running. Might Microsoft have preferred a BSD-licensed opponent to a GPL'ed one like Linux? Of course! It would be much easier to embrace and extend a BSD licensed package.

It might even be a good thing for Microsoft to sell an OS that runs Windows and *NIX apps on a fast and reliable OS. WinBSD, anyone? ■

Get saucy with Pete at opensauce@cpumag.com.



Words From The Web

Yeah, they *actually* said this . . .

"Can some1 help? My registry has disappeared."

From a Yahoo Computers chat room

"All I can picture is a bee flying at someone and they react thus sending them and their scooter into oncoming traffic."

Message posted on a blogspot user's site about the Segway scooter.

"The road rash is healing and my butt itches so bad and I can't scratch it . . . aaaaarrrrrrrgggggggghhhhhhhh."

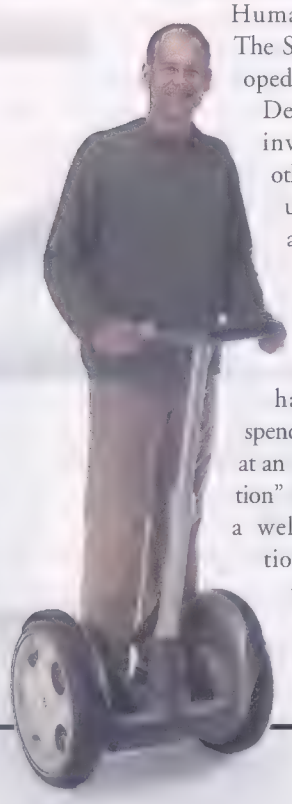
From a Topless Topics message board

"Christmas in Hawaii will suck for me this year."

From an AOL books chat room

Ginger Is Not It

When we went to press in December, the Internet was atwitter with news of the unveiling of the mysterious "IT," also known as Ginger and officially known as the Segway Human Transporter. The Segway was developed by science guru Dean Kamen, who invented, among other things, a stent used to keep the arteries in hearts free of gunk. Incidentally, this stent is the reason Dick Cheney has been able to spend most of his time at an "undisclosed location" lately, rather than a well-marked location six feet under the ground.



Ginger has been a hot topic on the Internet for months, fueled in part by rumors that industry bigwigs, such as Apple's Steve Jobs and Amazon.com's Jeff Bezos, were going to burn their cars, cut off their legs, and ride Ginger until the cows came home, or something like that. "IT" was supposed to change the very nature of transportation. In December 2001, Kamen unveiled his creation, which turned out to be a $10,000 gyroscope-laden, one-person scooter that is supposed to be as intuitive to steer as it is to walk on the sidewalk. Kamen guarantees that the scooter will not tip over.

Reactions from the online community were mixed. Some users were intrigued by the Segway, though they felt it was too expensive. Many thought the Segway was overhyped (imagine that!) and didn't care for it at all, pointing out several limitations and drawbacks of the product.

Clearly, the Segway is not designed to replace cars. It's a one-person vehicle, after all. You're not going to use it take your date to the Point and watch the sun go down. It's not a grocery-getter, either. The only trunk Segway has is the one on your backside, and don't even think about trying to pack that. Police and postal employees are expected to be among the first to take Segway out for a spin. It'll be interesting to see how much postal workers like the scooter when they try to plow through eight feet of snow with it.

A less-expensive consumer version of the Segway should be available sometime in 2002. I can hardly wait to see how this works out. Most people I see on the roads are as good at driving as they are at building geodesic domes out of Jell-O. I anticipate many Segway-related accidents. ▲

by Michael Sweet

'Tis To Laugh

Everyone likes a good joke, but some people take jokes more seriously than others. Dr. Richard Wiseman and the British Association for the Advancement of Science set out to find the world's funniest joke. Internet users submitted jokes to the Laugh Lab Web site (www.laughlab.co.uk), and visitors to the site read and rated the jokes. The votes have been tallied, and according to Laugh Lab, the following joke is the funniest:

Sherlock Holmes and Dr. Watson are going camping. They pitch their tent under the stars and go to sleep. Sometime in the middle of the night Holmes wakes Watson up.

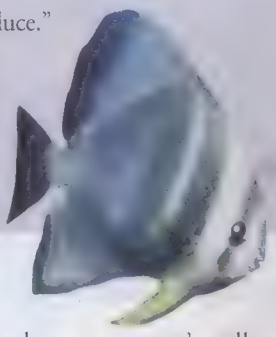
"Watson, look up at the stars and tell me what you deduce."

Watson says, "I see millions of stars, and if there are millions of stars, and if even a few of those have planets, it's quite likely there are some planets like Earth, and if there are a few planets like Earth out there, there might also be life."

Holmes replied: "Watson, you idiot, somebody stole our tent!"

Ba-dum-bum.

This experiment has another purpose besides finding the world's funniest joke: The researchers are investigating the nature of humor, such as why men enjoy some jokes that women don't like, and vice versa. Laugh Lab will continue to release voting results on a monthly basis.



Internet, Unplugged

Hundreds of thousands of Excite@home broadband subscribers had a rude awakening in early December 2001, when they discovered that the company's financial assets were sitting on the cold porcelain toilet of bankruptcy. Excite@Home filed for bankruptcy in September 2001, but continued to provide broadband services until December. AT&T had plans to buy the services, but Excite@Home didn't like the deal and received permission to unplug its users' broadband connections, which it did. As a result, more than 800,000 Excite@Home users found themselves without an Internet connection on Dec. 1. AT&T was able to reconnect most users to AT&T's own networks within a week. A few other Internet broadband service providers, such as Comcast, have until Feb. 28, 2002, to move former Excite@Home users to their own networks.

Virtual Aquarium

We've all seen screen savers in which exotic fish swim across your monitor, but DALiLab has put an interesting new twist on this old idea. Using a program called DALiWorld (www.daliworld.net), virtual fish will "swim" across the Internet from your PC to another DALiWorld user's PC. Fish will also swim from other users' systems to your PC.

You'll start out with a preselected number of fish, covering a variety of species. You can create one species of fish that is unique to your system; that is, until it swims away to someone else's PC, thus distributing its kind across the great virtual ocean of the Internet. I installed and ran the DALiWorld program and started receiving fish from Warsaw and Toulouse in just a few minutes. You can check the "history" of each fish to see all the places it's been.

The program has various controls so you can follow a specific fish around the aquarium, as well as pan around the aquarium to change your point of view. If you know other DALiWorld users, you can list them as Neighbors using their DALiWorld ID. You can run DALiWorld as a program or simply use it as a screen saver.

TIME WASTERS

Infinite Loop

That Voodoo That Sold So Well

During a few days in December, we tracked the sales of 3dfx Voodoo video cards on eBay and found that not a single card sold for more than $200. So why did a card that sold for $600 two years ago sell on eBay in late 2001 for $2,150? The card's description says it all: The Voodoo5 6000 was among the last video cards 3dfx manufactured before going under, and only 50 or so V5 6000 cards were made. The V5 6000 has its own power supply, four VSA-100 graphics chips, 128MB of RAM, and texture map resolutions up to 2,048 x 2,048.

If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to fringe@cpumag.com

Inside Keyhole's EarthViewer

Get A PC With A View

Whether you want to see a view of the Earth or a view of your hotel, EarthViewer can deliver. There goes your excuse for getting lost.

Forget about the flat, grayscale lines and dots of a GPS when EarthViewer from Keyhole is on the job. With EarthViewer, users can fly across the globe and move around within a continent, city, or neighborhood as easily as navigating the virtual spaces of Quake. And EarthViewer renders many areas in such detail that you'll be able to find not just your house but also the slope of the hill in the backyard and how close your house is to the nearest Italian restaurant.

EarthViewer is an application that lets a user interact with the nitty-gritty detail on every corner of the earth, including elevation, roads, and city grids. With EarthViewer, users can also enter data to create their own maps, which is useful for anyone wanting to plot demographics or customer data across a physical plane.

EarthViewer offers global coverage, but the coverage is better in some areas than others. In 50 major metropolitan areas concentrated in the United States, Japan, and most recently, Afghanistan and Pakistan, viewers can see an aerial view in clear detail within 1 meter of an address or location. But in, say, sub-Saharan Africa, users may only be able to focus in on objects at a distance of 120 meters. So for locations, such as San Francisco, with a lot of location detail and a short meter distance, there is plenty of opportunity for a user to zoom in from a bird's-eye city view to a closer look that scales down to a building.

Zoom In

It's no surprise that EarthViewer's graphics are gaming-quality good, as that's how this application got its start. Keyhole is a spin-off of game-developing company Intrinsic Graphics. In 1999, the company used the same space definition platform used for creating video game graphics for mapping technologies using real places, relying on the same principles and flow of navigation that gamers enjoy in virtual worlds. After development, research, trial, and error, Keyhole launched with the technology, now called EarthViewer, as a separate company in January 2001.

The flagship product already has a strong foothold in the real estate and government sectors but hopes to gain a stronger presence in the consumer or business travel, broadband, or wireless marketplaces. For real estate professionals, the service has proven to be a good way to show a property or a neighborhood without being there and an excellent tool for relocating clients. EarthViewer has also simplified city administration and management for government officials across the nation, and Keyhole already lists the United Nations among its growing list of clients.

Behind The Curtain

EarthViewer may have been inspired by game play, but the technology that powers it is quite serious. EarthViewer aggregates information from a dozen different mapping, location, and area information services, such as colored, high-resolution aerial photos from AirPhotoUSA; satellite imagery from i-cubed; detailed ground simulation visuals from ARC Science Simulation; street information and address mapping from GDT (Geographic Data Technology); and 4.5 million business listings from infoUSA.

To create the EarthViewer system, Keyhole licenses content with providers, brings together all of this information, and layers it onto servers that store several terabytes of data that is, essentially, pictures and location information of the entire world. The information is then processed and fused by proprietary software into the single, smooth EarthViewer application interface. EarthViewer hosts this information on its company servers.

The second bit of Keyhole's proprietary application tells the servers storing this information how to serve up the data and how to stream heavy graphics across a

Top Brass: Interview With Keyhole CEO, John Hanke

John Hanke is certain his company is on the right course for success. He's navigating operations toward mobility, multiplatform capability, and value-added services.

CPU: Who or what is your competition?

Hanke: Nobody is doing what we do today: allowing users to fly through the earth, in 3-D, in real-time. We're competing against maps online, but we're the next generation of mapping technology. Some people in that business could be our partners, but we don't just see them as competition.

CPU: Are there any plans for a Mac version of the software or for expanding to any other platforms?

Hanke: We have the capability to migrate to them, but we have no definitive plans for other platforms. Alchemy, the 3-D engine, is the underlying technology we use, and that's an Intrinsic product available only for the PC.

CPU: What long-term goals do you have for the EarthViewer technology?

Hanke: Our desktop product is a preview of what people will be doing on mobile devices five years in the future. We're dedicated to taking the service out there. We think our technology was born to travel and that it will be more useful when interacting with the world. Location-based services will be a huge part of our business. We're working on things for cars and things that you carry with you that can run the technology. We'll be testing that in 2002, so that won't be out until 2003.

network. The information is compressed for maximum speed and clarity.

The last piece of the technology puzzle that makes EarthViewer unique is the client application that decides what part of this data the user should receive when making a request. For example, if you're looking at Lincoln, Nebr., EarthViewer knows to only stream relevant information to you regarding that location based on the information the user requests. In order to process information quickly, EarthViewer must serve up only the information you seek while keeping the remaining terabytes of information at bay. This tool moves the data along quickly to create a single, smooth, cohesive image of the earth's parts in which the viewer can move around and zoom in and zoom out, flawlessly.

Real images, not real-time. While the result looks fantastic, and the technology that fuses the information together works as smooth as silk, it's important to note that the data you see might not be an accurate representation. Images are not real-time video; they come from stored imagery from third-party sources that often don't update location information for up to 18 months. Although this might not be a factor if you are zooming in on the Grand Canyon or Mt. McKinley, this lag time could be a problem if you're trying to find a street or address in Chicago or Portland.

The Right Package For You

Keyhole currently only targets enterprise and government users as potential customers and provides two choices for deployment: With EarthServer ASP, users license the data, pay an annual fee, and host only the client application. In this case, the majority of information streams to users' computers only when they need it. Alternatively, offices can purchase the entire load of mapping information outright to run on the purchaser's own servers. This option is called EarthServer Enterprise.

A costly endeavor. Individual licenses for the ASP user run around $1,200 per user for a year's worth of access and support. EarthServer Enterprise costs around $200,000 for an annual, office-wide license to the entire library of information.

In either case, users have the choice of mapping data in 3-D, the most luxurious of all the graphics choices, that lets the user swoop across the globe, narrow in, and spiral out in what feels like real-time. Or, users can access mapping information via HTML, which, although it contains the same location and geonavigable information, is a static mapping service much like MapQuest or MapBlast or any other Web-based mapping service. HTML rendering cannot display elevation. Eventually, likely in the second half of 2002, users will also be able to access EarthViewer on their PDA or mobile devices using i-mode or WAP.

Offices who opt for EarthServer Enterprise also have the option of the EarthServer DataStream value-added upgrade. Corporate clients are hosting their own mapping location information, and as such, they can fuse this data with their own relational databases, such as customer lists and business locations, to create specific, personalized, business-critical information maps.

Keyhole is planning to release a consumer version of EarthViewer in the second half of 2002. The consumer product won't have some of the features the corporate product offers, such as demographics, zoning information, or MLS data, but it could include information on camp sites, hiking trails, and value-added content such as restaurant reviews. This service will cost between $100 and $200 for annual access.

Mapping Out The Future

Keyhole's EarthViewer is mapping out a path toward creating a better picture of the planet and sharing that information with the people who need it. And if Keyhole stays on track and keeps boosting its product's availability and value, the results could make for a pretty picture. CPU

by Karen Solomon

Coder's Corner: XML

Behind The Hype: Why XML?

In this Coder's Corner, Ian Graham will show you how to program with XML. He'll also provide Web-development tutorials and tips. Ian is the author of numerous books pertaining to Web development, including "The HTML Sourcebook" and "The XML Specification Guide." Ian co-founded and served as vice president of research and development of Groveware until 1999. He is currently a senior manager in the Emerging Business Strategy Group at the Bank of Montreal, and he continues to teach, lecture, and give presentations on Web-related topics.

For a language that's only existed since mid-1998, XML (Extensible Markup Language) has certainly been getting a lot of press. It seems you can't browse a trade magazine without reading of the latest XML framework, messaging solution, or database interface or about how this technology is going to change your life for the better.

Given the hype, let's ask the question: Outside of the tech world and trade magazines, just how important is XML

That's a hard question to ask, so let's ask it indirectly by counting how many Web pages refer to "XML" and compare this with the numbers for other popular (and less-technical) phrases. A search for "XML" at www.google.com returned 9,880,000 hits, greatly exceeding the hits for "happiness" (1,790,000) and "United States" (4,310,000). It was actually harder finding terms *more* popular than XML. "Java" was one (23,500,000). We'll let you figure out some of the others.

This doesn't mean XML is more important than happiness or the United States or necessarily less important than Java. It does verify that XML is pretty important—10 million is a lot of pages. So the excitement and interest is real. But why? After all, XML is really just a tool designed to solve a single problem: ensuring the reliable sharing and communication of information between computers. Why is that such a big deal?

The Deal Is . . .

It's a big deal because otherwise there's an infinite number of ways to encode data before sending it to or sharing it others. Suppose you want to send a message containing three pieces of data: a URL, a file size (an integer), and a date. One way is sending the raw binary data, which is basically a copy of the computer memory containing the data. Another is sending the data as a string of characters corresponding to the digits and letters in the strings or numbers but use some sort of special character or byte sequence to denote the end of one chunk of data and the beginning of another. Alternatively, you could send data as a sequence of fixed-length records, each record containing one of the data fields. The receiver counts the length of the data chunks as they arrive (if it knows the length of the records) and chops the data into different records.

On top of this are many ways of encoding the individual data parts. For example, you could encode strings of characters using EBCDIC (Extended Binary Coded Decimal Interchange Code), ASCII, or dozens of other standard character set encodings, which define how a character is represented as a string of bytes. Numbers can be sent as strings of character digits or as binary data using many possible encoding schemes, such as IEEE 754. But you'll also have to decide if the binary storage will be big-endian or little-endian. Also, if you send character data using so-called "wide" character set encodings—ones that use more than 1 byte per character—you'll need to make sure to put the bytes in the right order.

All these approaches make good sense, but they suffer from the same (big) problem: How will the

person receiving the data know how to unpack and use it? One solution is telling the recipient ahead of time about your data format. But that doesn't help someone you don't know; on the Web, there are a lot of such users. More importantly, this approach doesn't help developers who write the code to handle your data. These poor souls would have to write brand new data parsers for every new quirky data format they need to read and process. This approach definitely won't make you any friends.

The New ASCII

XML simplifies the problem by setting itself as *the* standard way of encoding data for exchange between applications. In the XML world, all users drop their own personalized approaches for encoding data and use XML instead. This works because the careful design of the XML specification ensures that once someone creates proper XML, everyone who receives it can unpack it correctly.

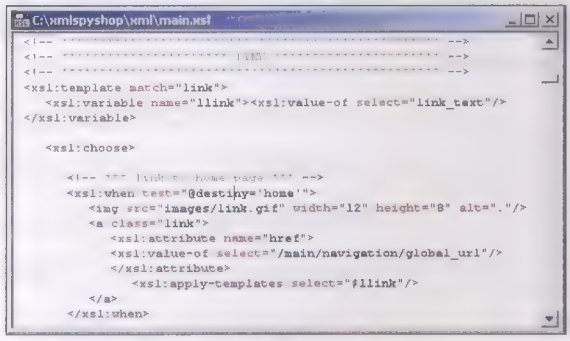
The key to this is some simplifications about the types of data you can encode and careful rules for constructing well-formed, or syntactically correct, data. As to the first issue, XML requires that all data be so-called printable characters—binary data isn't allowed. This turns out to not be a very onerous condition because most data, such as numbers, dates, or simple text, is easily written as a string. Other types of data, such as audio files or images, can be encoded as character sequences (using other standards such as base64 encoding) if you need to put them inside XML.

Or, and perhaps preferably, they can be sent as-is and not as part of an XML document. After all, not everything needs to be sent as XML.

A second part of XML defines how you express, using the XML syntax, the data structure you want to send. XML lets you express this quite richly. You can define complex hierarchical structures, include the actual data at any point in that hierarchy, and name each different part with names that help identify what the part is or what it is for. Thus, using XML, you can send a URL, a file size (an integer), and the date the file was last modified (as a standardized date string) as the following XML message example:

```
<dataChunk>
   <url> http://www.w3.org/TR/xml11/
        </url>
   <fileSize> 1321211 </fileSize>
   <lastModified> 20010412T12:32:54Z
        </lastModified >
</dataChunk>
```

This example contains a single XML element named *dataChunk*, which in turn contains three other XML elements named *url*, *fileSize*, and *lastModified*. The XML syntax rules define the rules for writing the tags (such as <data> and </lastModified>) and the rules by which the data can be laid out (how every part is nested inside the other).



XML Spy 4.2 Suite (www.xmlspy.com) is one of the more popular apps for creating and editing XML documents.

Whoever receives this message can now unpack the data to create a *dataChunk* data element that contains the three other parts, each with the given string values.

This works because the rules of XML guarantee that *any* piece of XML software can accurately do this with *any* accurately constructed piece of XML. Indeed, the XML specification defines a special phrase—*well formed*—for correctly constructed data. The specification also says how XML parsers (the software that processes the XML) must behave: If the data is not well-formed, the parser must stop processing the data and must indicate a fatal error.

Thus, by definition, all XML data is well-formed, and any piece of XML data will be identically converted into data a program can use, independent of the program doing so.

This doesn't solve all the problems. The receiver of some XML data doesn't magically know what the data inside the message represents or what to do with it. However, eyeballing the data, which is possible because the XML format lets you see how the data is constructed (conveniently with names for each part), can quickly help people figure out what the parts are and what to do with them.

In a sense, the difference between XML and binary data is the difference between an open box of tools (XML) and a locked box without the key (binary). In the former case, you can simply look at all the tools, figure out what they are for, and decide what you want to do with them. In the latter case, you'll probably spend all your time just trying to figure out how to unlock the box to see what's inside.

What's All The Other XML Stuff?

The big idea of a universal data format really took off, resulting in a huge swell in demand for tools and technologies to manage and process XML. At the same time, there was a rapid growth in XML dialects, or predefined sets of elements and nesting rules aimed at encoding data related to specific tasks or problems. Indeed, whereas there were two XML-related specifications in 1998, there are more than 200 now and more on the way. There has also been an explosion in programming toolkits, application development environments, distributed computing frameworks (.NET anybody?), and more centered on the use of XML.

Needless to say, this series of articles won't be able to cover all these issues right away. The field is growing almost too fast to keep up. Instead, we'll focus on important concepts, put XML in context with other technologies, and prick the bubble of hype surrounding some of the more grandiose claims. CPU

by Ian Graham

by Lisa Lopuck

SVG: The Rising New Graphics Standard

There's been a lot of talk at Web conferences lately about the new-generation graphics format: SVG (Scalable Vector Graphics). So what is this new format? How ready for prime time is it? And why do we care about it?

What Is SVG?

SVG graphics are promising because, like Flash graphics, they are resolution-free, fat-free scalable graphics. And just like HTML elements such as tables, SVG graphics are drawn dynamically in your browser by following code (XML) instructions either embedded in your HTML page or coming in from a database.

SVG graphics are promising because, like Flash graphics, they are resolution-free, fat-free scalable graphics.

You can draw three different kinds of objects in SVG: shapes with lines and curves, images, and text. What's cool about SVG text is that it's searchable like normal HTML text, but you can stylize it with clipping paths, filters, and masks to get bitmap-like effects. As for SVG graphics as a whole, you can animate them through scripting and make them interactive via normal handlers like a mouse rollover or click. SVG graphics also feature unlimited color and font choices, and when you print them, they come out clean as a whistle because they are resolution-free. All this plus SVG graphics are fast-loading and ready for wireless applications! SVG is like the Web graphics panacea.

With such features, it's only natural to compare the SVG format to Flash. While the two are similar in their vector, scalable, fast-loading approach, Flash uses proprietary technology, while SVG uses open-source technologies. Basically, you can look at the code and see what's going on with SVG graphics, while a Flash movie is an encapsulated chunk on the page.

Is SVG Ready For Prime Time?

The short answer is yes and no. There are a few sites beginning to use SVG graphics, but the problem is viewing and making them. To view them, you have to download an SVG plug-in from www.adobe.com/svg, and few people have done so. Microsoft plans to support SVG in future browsers, but as of now, it's all about plug-ins that are still evolving to display all of the cool SVG features.

The other problem is creating SVG graphics, not to mention animating them and making them interactive. Unless you are an XML coding whiz, your options are limited. One program by Jasc called WebDraw allows you to create non-interactive SVG graphics with simple animation. The best tool on the market for creating SVG graphics, however, is not surprisingly Adobe Illustrator 10. Because Adobe has the plug-in for viewing SVG graphics, the company figured it should have tools for building them also. Illustrator even allows you to apply SVG native filters for those bitmap-like effects I mentioned earlier. More promising, however, is Adobe LiveMotion 2.0. In its newest release, this Flash fighter will allow you to build interactive animations in SVG format—finally taking advantage of all that the format is capable of. Macromedia better hurry up!

In conclusion, SVG is definitely a rising star in the Web graphics arena and one to watch, but I would be careful in using it in clients' sites only because, at this point, most people won't be able to see it. For more information on the SVG format, check out www.adobe.com/svg/community/external.html and www.w3.org/Graphics/SVG/Overview.htm8. ■

I'm interested in your thoughts—please share them with me at lopuck@cpumag.com.

Lisa Lopuck, www.lopuck.com, is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.

by Rob Malda

tragedy.txt

Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler then he actually is.

It's hard to look very far online without reading about the dot-com bust. Countless Web sites laying off most of their workforce or just disappearing entirely. Stocks trading at pennies a share. Spoiled Gen-Xers with gigantic debts and loans against options that are worth less than their surface area in wallpaper. But the real tragedy of this is what it means to the future of the 'Net. And even if you don't own a single share of any bankrupt dot com, the bust is gonna get you.

My day job is running a site called Slashdot. We followed a fairly typical path for a successful Web site early in the dot-com boom: hobby/lifestyle turned full-time job. This was largely possible because of the huge hype surrounding the dot-com sector. Cheap bandwidth and co-loc was possible. Our real expense was our own time, which we happily gave because we enjoyed what we were doing. We grew from zero to half a million pages a day on little more than sweat, but growing to the millions of pages we serve now required real corporate backing, which we got when we were acquired by a corporate daddy.

This journey probably wouldn't be possible today. Certainly there are countless hackers out there with more skills than me and the willingness to work the ridiculous necessary hours. And the 'Net has room for countless niche Web sites with hundreds of thousands of users. But Slashdot's timeline fell into a great place in the dot-com hype. Sure, we had a site people wanted to read (I think we still do despite the detractors), but our success might not be replicable in the darker online world of 2002.

Things on the 'Net are a lot colder than they were five years ago. Banner ads are worth little more than the bandwidth it costs to serve them. The value of a quarter of a million eyeballs a day is a fraction of what it once was. And users expect a more interactive experience, which requires more programming hours to create.

What does this mean? As ISPs will continue to swallow each other, hosting costs will continue to rise. Free sites like Geocities will still exist, but bandwidth caps will make it increasingly difficult for the individual to stand out online and be heard by many people. The sites that do somehow manage to tap into a need will be destroyed by the expense associated with providing hundreds of thousands of people with content. Only the corporations will be able to afford to spread their memos across the 'Net; the individual will be squeezed out of the picture. The great equalizer is becoming just another communication medium dominated by a handful of those with the money to control it.

As one company buys out the next, the digital world will converge . . . on the same mainstream world the 'Net seemed destined to destroy. We were right of course: Television, radio, and newspapers will be eradicated or dramatically altered by the might of the Internet. Maybe not today, but soon. But the same big corporations will be in control. They're simply going to be the only ones who can afford it.

Having the megabucks to buy the biggest microphone should not guarantee anyone the ability to reach a larger audience than an individual with something important to say.

Five years ago, a couple of guys in the middle of Michigan could start a Web site with little resources outside their own time, and they could become noticed on a global scale. But today, without the dot-com hype, only the corporate monsters will be able to spread their dogma.

The ability of individuals to share their ideas is what made the 'Net great. I just hope that it remains possible for individuals to be able to compete with the corporations in spreading their ideas. Having the megabucks to buy the biggest microphone should not guarantee anyone the ability to reach a larger audience than an individual with something important to say.

Is there a solution? Maybe someone will concoct a micropayment system that will make it possible. Maybe tipping Web site creators will become the norm. But somehow I doubt it. And that is the true tragedy of the dot-com bust. ■

Hate mail, love letters, and haiku can be sent to malda@cpumag.com

by Joan Wood

PartyOn Line

Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an indepedent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment where she produced the two Cyberia games. Before 3-D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.Com, where she was co-founder and managing editor, Joan has retired.

The view from Silicon Valley can be a much distorted one. It becomes difficult to discern how much the Web has become ubiquitous in our everyday lives and how much is just over-the-top techy fixation. In other words, is it just us Geeks, or does everyone use Webtender.com?

Paperless Invitations by Evite.com: Do you even remember the last time you received a party invitation on the phone or through the mail? E-mail is certainly the norm and has been brought to its ultimate form in the free Evite online activity planning center, now owned by Ticketmaster, which allows users to design and e-mail event invitations, track RSVPs and guest comments, and take guest polls to make group decisions including changes and updates. For group event planners, Evite even offers up-front payment collection of participant fees through PayPal so the organizer doesn't get stiffed for some moocher's portion of the keg or their concert ticket.

At a recent party, the host's computer was, quite unobtrusively, the central figure. Wireless LAN and a DSL connection, augmented with a few extra goodies provided all the necessary ingredients. . . .

Mood Lighting from X10.com: Designed to give ultimate control over your home appliances and lighting, the ActiveHome 14-piece "SuperDeal" kit includes lamp, appliance, and wall switch control modules, as well as the PC interface transducer. Once programmed using your PC with all your preferences, schedules, and settings, ActiveHome is independent of the PC and uses your existing house wiring to send the signals (wireless remotes included for manual operation) to lights and appliances. Also useful for security, the system can "learn" your daily usage patterns and duplicate them while you are on vacation to get that "lived in" look. DJ Kev (who will reprogram my Echo station if I don't mention Linux) recommends starting out the festivities with a moderately bright lighting scheme while guests are settling in and slowly transitioning to darker "mood" settings after the first round of drinks has had an effect. And don't activate the strobe light until well into the dance phase of the evening.

Dance Music by Echo.com: This 60,000+ song library streaming music service enables users to create an online music station with playlist programming influenced in real-time by listener ratings. The Echo Music Messenger allows users to use instant messaging to coordinate voting with friends. Echo's service claims to meet the legal requirements of the Digital Millennium Copyright Act so you *should* be OK with the Feds & Metallica, but I'm not a legal expert. Other streaming music sites recommended: Live365.com, Spinner.com, Shoutcast.com, and Launch.com. These offer various features and streaming methods (that's another column) but do pay special attention to all the checked boxes during the signup process, especially when you return to a page, as the defaults often reset to "send me a whole bunch of e-mail" settings.

Mixed Drinks from Webtender.com: This is a rather long-in-the-tooth but still quite useful collection of mixed drink recipes, created originally as an exercise in database design. Browse/search through more than 6,000 drinks with detailed mixing directions and a reference database of ingredient descriptions, including alcohol content and links to manufacturer and enthusiast sites. Add recipes, rate existing ones, create a list of favorites, and use the "In My Bar" feature, which tells you what drinks you can mix with the ingredients you have on hand. The Webtender also includes the "Pick Random" drink selector, great for indecisive guests. (I suggest a round of MotorCityOnline.com for iffy drivers before they get their keys back.)

Can surfing for party guests be far off?

Live Web Cam by Inetcam.com: Whether bragging or begging, nothing speaks louder than a live Web cam. They're especially useful for sick-at-home friends seeking vicarious distraction but also accessible by the out-of-town girlfriend, so be warned. Moderation recommended when used in conjunction with Webtender.com. Download the iVISTA 4.0 Video/Audio/V-Mail Personal Edition and use it, fully featured and without a registration code, for a three-day evaluation period. If the party lasts longer than three days, expired software will be way down the list of worries. With the explosion in online singles ad services, can surfing for party guests be far off? Don't be a virtual wallflower, pass the cheese whiz. ■

Is this out-of-control Geekdom, or are you finagling an Evite to our next soirée?
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CREATIVE

by Chad Denton

Road Warrior

Palm vs. Xerox, Pocket PC Mobile Phones, The Friendly Skies Get Friendlier & More From The Mobile Front

Earth & Sky

ISP EarthLink (www.earthlink.net) and wireless service provider OmniSky (www.omnisky.com) announced in a plan December 2001 to save OmniSky's 32,000 subscribers from an @Home-like fate. Under the plan, OmniSky will file for Chapter 11 bankruptcy, allowing it to continue operations until the sale of all OmniSky assets can be completed to EarthLink, rapidly advancing that company's EarthLink Everywhere initiative. EarthLink will purchase OmniSky's customer base and back- and front-end technologies.

OmniSky provides wireless data services to PDA users over CDPD networks with top speeds of 19.2Kbps. While 19.2Kbps isn't exactly blazing fast, it's pretty quick for wireless data. OmniSky-compatible modems are available for some of the more popular Pocket PC and Palm OS devices, including the Palm Vx, the Handspring Visor, and the Compaq iPAQ.

The plan is subject to approval by a U.S. bankruptcy court. Here's hoping for a smooth transition for OmniSky users.

Boeing Does Broadband

You may soon have a fat pipe connecting you to the Internet at 30,000 feet. Connexion by Boeing (active.boeing.com/connexion) is the high-speed data service Boeing is planning to offer in its commercial, private, and government aircraft.

At the heart of the Connexion system is Boeing's proprietary phased array receive and transmit antenna. The antenna, which Boeing developed in 1986, not only supports higher data rates, but it's also more responsive, permitting it to maintain an uninterrupted satellite connection as the plane moves through the sky. Speeds of 5Mbps (download) and 1.5Mbps (upload) mean many of us won't want to get off the plane.

Data Is Job #2

Wingcast (www.wingcast.com), a joint venture between Ford Motor Company and QUALCOMM, took a step closer to bringing its service to market when it announced partnerships with Amdocs, Ericsson, and Verizon Wireless. Under the agreements, Wingcast will use Verizon's wireless networks for voice and data and combined technology from Amdocs and Ericsson for customer billing.

Wingcast is an OnStar-like service to be incorporated first into Ford and Nissan automobiles. Services include e-mail, SMS, traffic reports, driving directions, route selection, and personal concierge services. The interface is voice-driven and designed for minimal driver distraction. Some additional services will be accessible only by a passenger. Wingcast hopes to have systems installed on 2003 models.

Pocket PC Cell Phone

Rumor has it that belts were once worn to hold up a person's pants. Today, of course, belts are the things to which we clip electronic gadgets. In an attempt to remove the clutter clinging to our belts, several companies are trying to develop PDA/cell phone hybrids. A British company, mmO2, has developed a Pocket PC mobile phone it calls the O2 xda (www.bitecomm.co.uk/O2xda).

We managed to catch a glimpse of a prototype at Internet World in December 2001. The O2 xda includes all the software you would expect to see on a typical Pocket PC. You can listen to music using Windows Media Player, edit a document or spreadsheet using Pocket Word or Pocket Excel, and check your e-mail and schedule appointments using Pocket Outlook applications.

The O2 xda uses GSM networks for voice and GPRS networks for data. Because the Pocket PC can multitask, it's possible to maintain connections to both networks at once. That means you could be talking on your cell phone while sending an IM to a friend, managing your Web server remotely, downloading an Excel spreadsheet from your corporate network, checking your e-mail, and looking up the latest movie listings.

Now that I've got you salivating, it's time for the letdown. As always seems to be the case with really cool wireless gear, GSM carriers in North America have no plans to support the new phone. The most likely candidates include AT&T Wireless, VoiceStream, and Cingular Wireless, but at press time, there were no plans for a Pocket PC phone to make its way stateside anytime soon. Lucky Brits.

The O2 xda from mmO2 combines a Pocket PC with a cellular phone. Users can talk on the phone and surf the Web at the same time.

U.S. users will have to wait to try the NEXiO S150. The first in Samsung's Wireless Hand PCs line, the NEXiO was only available in Korea at press time.

The NEXiO S150 Makes Its Debut

Samsung announced yet another toy U.S. residents won't get to play with anytime soon. In fact, the company teased us with it at CES in Las Vegas last January. The Samsung NEXiO S150 is currently available in Korea and includes an impressive list of features.

The NEXiO is small and light, measuring 3.6 inches high x 6.1 inches wide x 0.6 inches deep and weighing in at 8.5 ounces. The NEXiO has a landscape orientation as opposed to the typical portrait orientation of most palm-sized computers. This means the 5-inch display is wider than a typical PDA display and can accommodate the width of a typical Web page.

The NEXiO is larger and heavier than a Palm V, but it can do so much more. For starters, the NEXiO features CDMA2000 1X wireless capabilities and can send and receive data at speeds of roughly 144Kbps. Not only is the NEXiO wireless, but it includes a USB port for connecting a mouse, keyboard, and other peripherals including a GPS receiver, wireless LAN modules, and digital camera. A VGA Out port and PowerPoint Viewer software let you use the NEXiO to deliver presentations. The NEXiO includes a fashionable reflective TFT LCD display that should be readable in almost any light.

The NEXiO is based on Windows CE 3.0 (not Pocket PC, mind you) and, like almost all new and expensive portable gadgets, can play MP3 files. For you bookworms out there, the NEXiO includes an e-book reader, as well. More particle software includes a PIM application, software for working with documents and spreadsheets, voice recording, e-mail support, and an image viewer. Samsung is still evaluating plans for a U.S. release. Why don't we ever get the cool toys first?

From Thin Air

Way back in March 2001, Palm announced plans to acquire Extended Systems, a company that develops and sells software that lets mobile employees communicate with their corporate networks. The move was supposed to give Palm a leg up in the enterprise segment where it's beginning to see stiff competition from Microsoft's Pocket PC. In May, the deal fell apart, thanks to plummeting stock prices. In December, Palm announced new plans to acquire ThinAirApps for $19 million in Palm common stock.

Like Extended Systems, ThinAirApps develops software to help mobile employees communicate with corporate networks. Palm hopes the acquisition will result in technologies that will make Palm a more appealing choice to corporations and other large organizations.

Most users will be familiar with ThinAirApps' ThinAir e-mail client for the Palm VII. Palm is more interested in ThinAirApps' corporate communication products, such as its ThinAir Server.

A recent ruling in favor of Xerox in its suit against Palm may force Palm to license Graffiti from Xerox or abandon it all together.

The Graffiti On The Wall

The U.S. District Court for the Western District of New York has ruled against Palm in its ongoing court battle with Xerox. The battle centers on a key piece of technology in Palm PDAs: its Graffiti handwriting recognition software. Xerox claims Graffiti violates its Jan. 21, 1997, patent for a technology it calls Unistroke, developed at Xerox's PARC research facility.

The court battles have been a bit of a roller coaster for both companies. In June 2000, a federal judge claimed Palm's Graffiti didn't use the same recognition patterns as Unistroke. But that June decision was overruled in October, and Xerox was allowed to proceed with its suit. The most recent ruling only claims that Palm and 3Com violated a valid Xerox patent and does not address any damages owed to Xerox. The next phase of the hearing will focus on damages, but the courts must first resolve Palm's appeal. In short, we'll hear a lot from this case in the future.

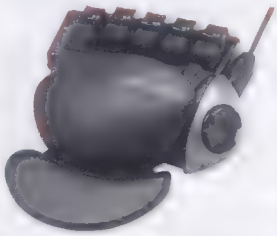
At Your Leisure

Compiled by Samit G. Choudhuri & Chris Trumble

Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in game consoles, games, PCs, DVDs, and just stuff we love, read on.

Nostromo n50 SpeedPad: Improve Your FPS Technique



Au revoir, SpaceOrb 360. Adios, Logitech CyberMan. Toodaloo, Microsoft Dual Strike. These products passed from discount bins into obscurity because they didn't follow through on the enhanced control they promised to the gaming masses.

Which brings us to Belkin's Nostromo n50 SpeedPad. WASD and cursor key gamers will find much comfort in the n50's ergonomics and control. The n50's keys, throttle, and D-Pad feature support for up to three levels of shifted single keys and macro programmability. The WASD alignment is more natural than the keyboard and lets you reach critical keys with ease. You can manipulate your mouse with the other hand and leave your keyboard alone.

We spent a substantial amount of time testing the n50 with Unreal Tournament, Half-Life, Quake III Arena, and Battle Realms. In each instance, we improved our game after a brief learning curve. With a longer learning curve, you could probably even play Flight Simulator 2002 with one hand on the n50 and the other on a joystick. Sports games fans might be able to get away with the n50, but we recommend sticking with a good game pad.

We'd like to see Belkin continue tweaking the drivers and software while adding new profiles for the latest games. We're happy that the n50 now has Windows XP drivers and software. Check out www.belkin.com/support/tech/gamingdownload.html for the latest updates and patches.

We can't say for sure that Belkin's USB controller won't pass into obscurity; we can say the Nostromo n50 is the most useful custom game controller we've used recently.

Nostromo n50 SpeedPad (PC and Mac OS 9)
Belkin
$35.99
www.belkin.com

DVD Bytes by Todd Doogan

THE DIGITAL BITS .com We Know DVD.

Read the full reviews plus a review of Queen: We Will Rock You at www.smartcomputing.com/cpumag/mar02/leisure

We're all a bit guilty of spending too much time in front of the computer. It's harder and harder to break away and catch a concert these days. But thanks to DVD, it's possible to catch a few shows and still crunch the keyboard. For your viewing pleasure, I present two concert discs worthy of your valuable time.

Sting: All This Time is based around a concert performed on the now legendary date of Sept. 11, 2001. Sting and his band build up from poignant and reserved to "take that, terrorists" rocking and rolling. Performing such hits as "Fields of Gold," "Roxanne," and "Don't Stand So Close To Me," Sting brings you closer to his real self and further from the rock-star image we see on TV. But best of all, there's a beautiful documentary about the rehearsals and meetings preceding both the concert and the horrifying events of Sept. 11. We watch as Sting and his band first hear about the event and come to grips with whether they should play. Thankfully, and obviously, they do.

U2: Elevation 2001—Live From Boston is a two-disc set boldly reproducing a show from U2's most recent tour. The coolest thing about it is that it lets you edit 12 songs from the show using the alternate angle feature. Along with the show, which rocks, by the way, there is a making-of-the-tour featurette, time-lapse video of the building of the set, bonus tracks, and DVD-ROM access with a screen saver.

Devil May Cry:
Funny Name, Serious Action

Dante takes on a shadowy, vicious demon boss.

Devil May Cry began life as Resident Evil 4, but it evolved into something very different that's quite a bit of fun to play. Capcom calls DMC a "gothic action" game, and it's easy to see where the label comes from. The game combines the crisp yet gothic look and third-person perspective of Resident Evil with much faster-paced, frenetic action and intuitive controls that make it hard to believe the game can trace its roots back to Resident Evil.

The hero of DMC is Dante, the half-human, half-demon son of the legendary dark knight, Sparda, a powerful demon who fought the forces of evil to protect humanity centuries before and won. Dante's primary motivation is to avenge the murders of his mother and brother, and as the game begins, a mysterious woman named Trish leads him to a remote island in search of clues. The island is a sort of gateway between the human and demon worlds, and shortly after entering a seemingly deserted castle, a flood of demons sets upon Dante and puts your skills to the test.

Dante starts the game with a sword and a brace of semiautomatic pistols named Ebony and Ivory. The sword is a blast to use and provides a number of attacks, and the pistols (with their unlimited supply of ammo) are great for crowd control. You'll quickly add other weapons to Dante's arsenal, most notably his father's sword Alastor, which gives Dante the ability to transform and take full advantage of his underworldly heritage. And you'll need all the help you can get: DMC's difficulty ramps up at a reasonable pace, but most players will find that they've often got their hands full, especially the first few times they take on DMC's inventive and gorgeously rendered bosses.

Devil May Cry won't scare you like Resident Evil occasionally does, but for PS2 owners looking for high-octane action and a lot of eye candy, this is a must-have title.

Devil May Cry (PS2)

$49.99
Capcom
www.capcom.com/devilmaycry

Jak and Daxter: The Precursor Legacy:
The Rebirth Of The Platform Game

Jak and Daxter, a couple of heroes with grit and moxie.

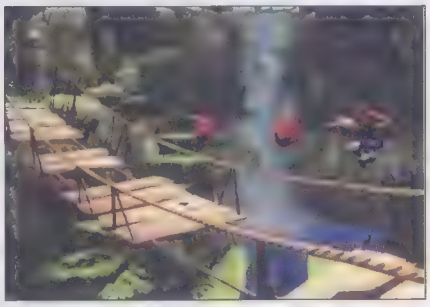
Ever since the advent of Donkey Kong in 1981, companies have been rehashing the run-and-jump platform genre. There have been some real winners over the years, but it's been awhile since a platform game this good came along.

This is probably due in part to the difficulty many developers have had making the transition from 2-D to 3-D. For obvious reasons, designing solid levels and providing tight controls are much tougher in 3-D. Nintendo's Super Mario 64 was probably the first really good 3-D platformer, and Jak and Daxter developer Naughty Dog had considerable success with its Crash Bandicoot series. But Jak and Daxter takes the genre to new heights.

Jak and Daxter are buddies, and life is good until they venture onto the forbidden Misty Island, where Daxter falls into a vat of a magical substance known as Dark Eco and turns into a largish rodent. In a panic, the duo rushes home to consult Samos, the village sage, who sets them off on a quest to restore Daxter to his previous form. Unfortunately for the intrepid pair, a horde of nasty critters known as Lurkers stands in their way.

Don't worry if the story doesn't exactly capture your imagination because it won't get in the way. The real value of Jak and Daxter is the experience of playing the game. Its sound, graphics, and overall atmosphere scream fun, and Naughty Dog throws in incredibly tight control. The end result is a joyous romp through several engrossing, colorful, and challenging levels that combine high-tech looks with a decidedly old-school feel.

Speaking of old-school gameplay, Jak's spin move and dive attack are strongly reminiscent of Crash Bandicoot's spin move and Mario's butt stomp. And although at a glance they may seem a little too derivative, rest assured that once you pick up the controller, you won't even notice.



Jak and Daxter is loaded with lush backgrounds and fast-paced platform action.

Jak and Daxter: The Precursor Legacy (PS2)

$49.99
Sony Computer Entertainment America
www.scea.com/games/categories/action advent/jakanddaxter

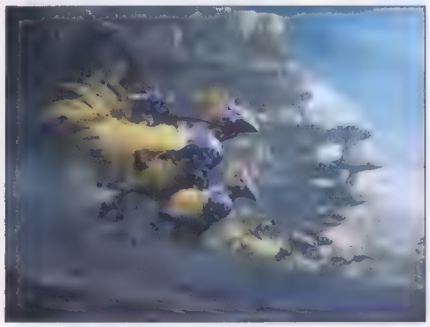
Final Fantasy X: Squaresoft Does It Again

A game franchise that's been around as long as Final Fantasy probably needs no introduction, but just in case you haven't enjoyed one of Squaresoft's RPG masterpieces, there are a couple of things you should know.

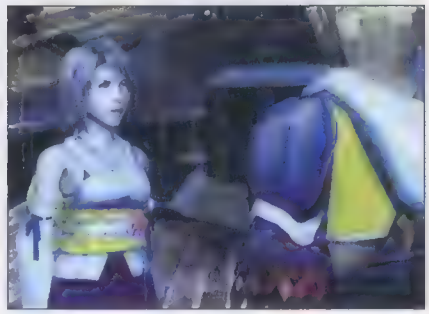
First, Final Fantasy isn't an action RPG with real-time combat; you'll battle an impressive variety of foes with a serious arsenal of weapons and magic, but the game features turn-based, menu-driven combat. This is bad news for adrenaline junkies, but it's fantastic news for gamers who appreciate a little strategy and a lot of options.

Second, in Final Fantasy, the story is king. Squaresoft is very comfortable pushing the line between games and movies, and this has become more apparent in every new installment since Final Fantasy VII, the first 32-bit Final Fantasy for PlayStation. This means you'll spend a lot of time watching movie clips as the game progresses, but don't worry about boredom. The cinemas in Final Fantasy X are some of the best.

The story revolves around Tidus, a young blitzball player from a high-tech city that is destroyed by a powerfully evil force called Sin (OK, so that's a little cheesy) in the opening minutes of the game. His mentor, a tough and somewhat mysterious guy named Auron, fetches him from the decimated blitzball arena and leads him to a rendezvous with some pretty strange happenings. Tidus finds himself transported to another place (and, possibly, another time) and meets a passel of new folks. Before you know it, he's embroiled in an epic struggle against the nefarious power of Sin, which initially manifests itself in the form of an enormous aquatic nasty and a horde of vicious monsters.



Of course, no Final Fantasy game would be complete without Chocobos.



Tidus gets to know Yuna, another member of your party who can summon powerful beings called Aeons.

Square packed FFX with puzzles to solve, people to talk to, and a fair amount of exploration, so stock up on your favorite foods and beverages, take the phone off the hook, and dive in to one of the best RPGs ever made.

Final Fantasy X (PS2)

$49.99
Square Electronic Arts
www.squaresoft.com

Check This Out On The Web

Want more? Read our review of Metal Gear Solid 2: Sons Of Liberty at www.smartcomputing.com/cpumag/mar02/leisure.

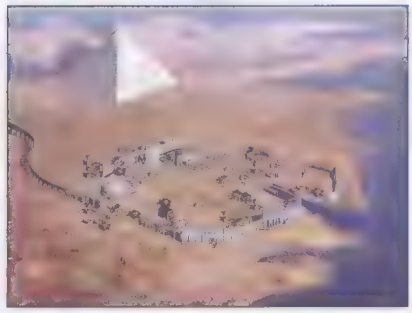
Sid Meier's Civilization III: A Return To The Addiction

For those of you who have been out of the loop for a while, here are the oversimplified basics of Civilization III. Selecting a new game brings you to 4000 B.C. in an unexplored world with a Settler and a Worker unit. You use your Settler to create a new capital city and get on with exploring as you set about building a civilization to last the test of time.

Building a grand civilization over thousands of years may sound simple, but it's not. You can learn the basic concepts within an hour, but it's unlikely you'll have the game mastered a hundred hours later.

Civ III plays very similarly to previous iterations, but there are some major changes. Each civilization has its own personality traits and ways of getting things accomplished. And there is now a unique unit to each civilization: Americans can eventually build the F-15, Germany the Panzer, Japan the Samurai, and so on.

Civ III's interface is more intuitive, and the introduction of new bonus terrain features adds more depth. One very major change is in the area of cultural influence, which can be increased by building city improvements, small wonders, and Wonders of the World. As your city and its cultural influence expand, so does its sphere of influence. You can observe the benefits of culture when another (or perhaps your own) culture defects to a civilization with more cultural influence.



Rule with an iron fist or a velvet glove? It's all up to you in Sid Meier's Civilization III.

We commend developer Firaxis for creating such an excellent successor to the classic Civilization. We expect most fans will find more than enough to continue the addiction.

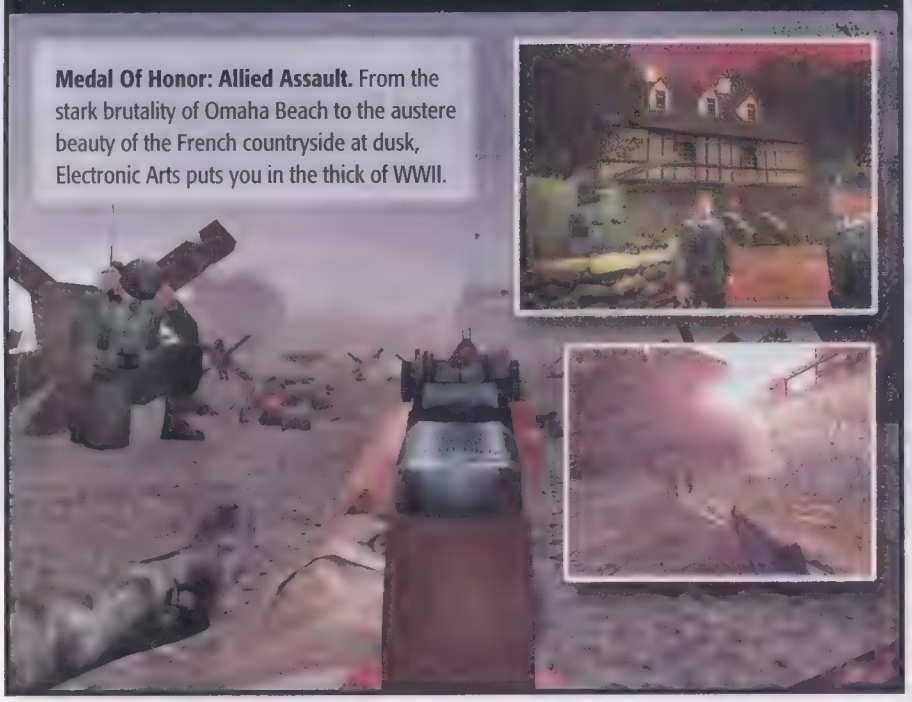
Sid Meier's Civilization III (PC)

Infogrames
$49.99
www.civ3.com

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Who needs eye candy? Remember how awesome games such as Alone In The Dark, Quake (3-D accelerated on Rendition's Verite), and Falcon 3.0 on a high-end i386 looked in their heyday? We know that great graphics don't hurt. There's nothing better than stellar gameplay combined with knockout graphics to make that killer game. These games have potential.

Star Trek Bridge Commander. The latest game to take place in Gene Roddenberry's Star Trek universe puts you in control of a Federation starship when a nearby sun explodes, damaging your ship and killing your captain. Developed by Paramount and published by Activision, this space sim takes you through more than 30 missions. Make it so.

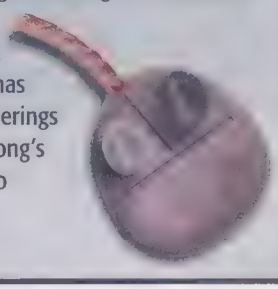


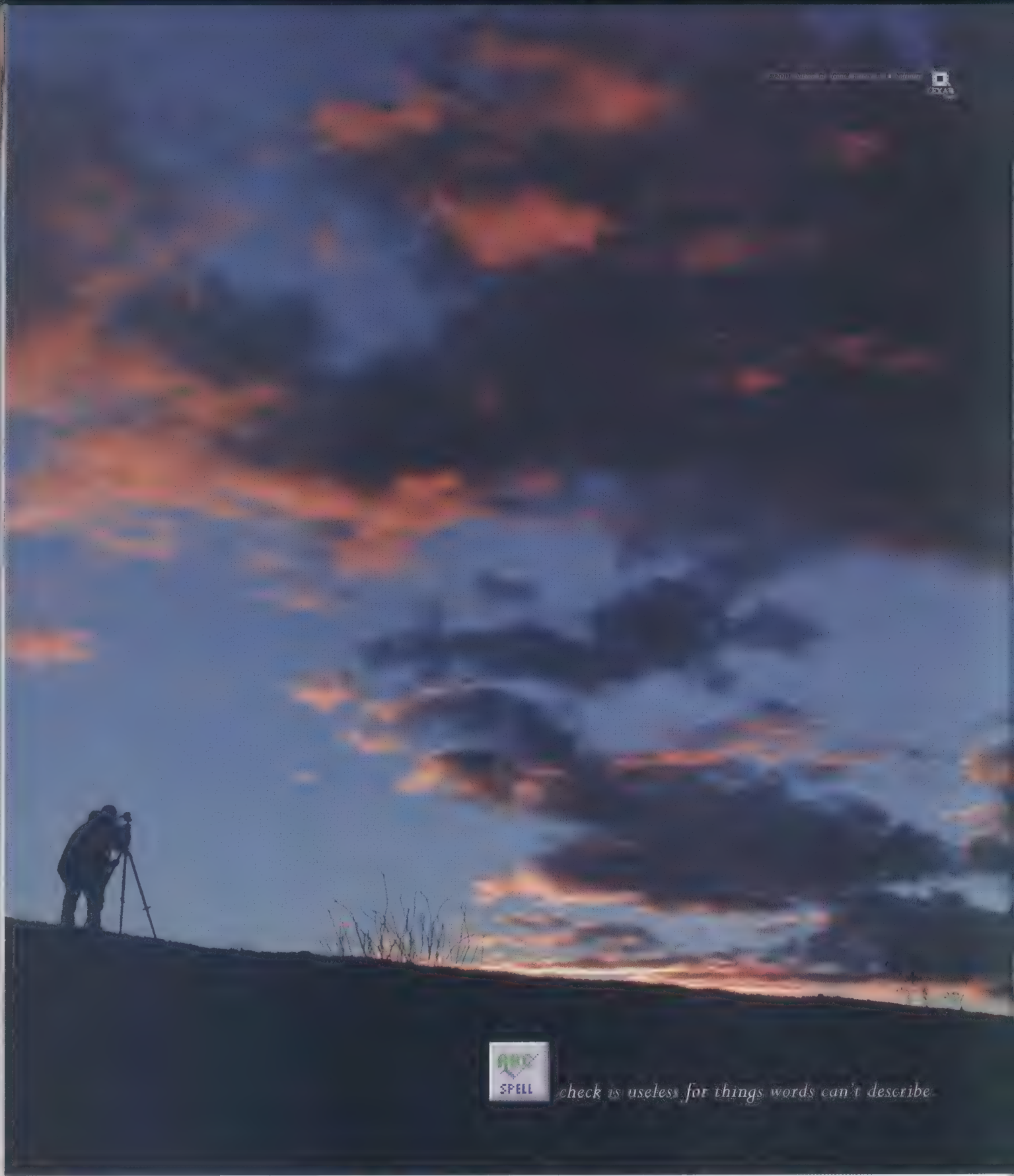
Medal Of Honor: Allied Assault. From the stark brutality of Omaha Beach to the austere beauty of the French countryside at dusk, Electronic Arts puts you in the thick of WWII.

Infinite Loop

Hand Ax Or Input Device?

It seems the Druids were way ahead of Silicon Valley when it comes to computer technology. That is, if you believe the research on display at The Institute of Druidic Technology's (www.jbum.com/idt) Web site. The Institute is currently devoting its efforts to proving that ancient inhabitants of what is now Britain had access to "advanced computer technology." Among the researchers' findings: a "Rod memory" structure made of hazel twigs with the equivalent of 20KB of data-storing power; a computer game called Osric the Stoat, in which the hero character violently hurls sticks at hedgehogs; and a mouse-type input device constructed of flint (misidentified as "hand axes" by less-knowledgeable archaeologists). Is the site just facetious meanderings or groundbreaking reinterpretations of archaeological findings? You decide. Either way, Osric the Stoat has color renderings that put Pong's graphics to shame.





While we can't put into words the impact of a Nikon digital image, we can tell you a little about the camera that created this one. Introducing the Coolpix 995. It comes fully loaded with 3.34 megapixel resolution, 4x Optical Zoom-Nikkor lens, automatic exposure with manual override, a pop up Speedlight, and a quick review feature that instantly allows you to scroll through your images. With this many options, the only limit is your imagination. Visit nikonusa.com or call 1-800-NIKON-UX.

Nikon

the Coolpix 995

Macro Mania, Part IV

Visualize A Better Excel

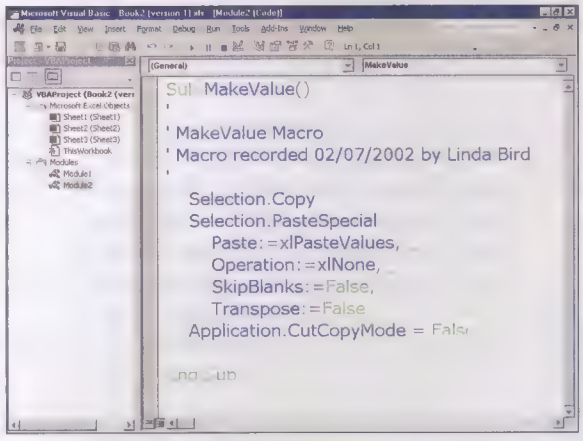
Like a well-trained dog, Excel is heeling, sitting, and fetching at your every command. And if you've worked through our previous Macro Mania articles, you've got a few VBA (Visual Basic for Applications) tricks up your sleeve. But there's more. You can refine your control of VBA so that it displays message boxes, runs multiple macros in sequence to perform complicated tasks, and distinguishes between relative and absolute cell references. In short, you can use VBA to tightly control which actions you'll let others (or yourself) perform in Excel.

In this article, the last in this series, we'll show you how to record relative and absolute references, develop a procedure that runs subroutines, simplify code, and create message boxes. We'll also share a couple of practical formatting tips to make working with VBA easier. And for those of you who just can't seem to get it right, we'll show you how to troubleshoot problems.

Easy On The Eyes

You don't format your code to make it look pretty. You format code to make it more readable. Luckily, VBA gives you a leg up on this process by doing a lot of the work for you. For example, VBA helps you differentiate between items (such as the comments and the executable code) in the Module Code window by automatically formatting them in distinctive colors. But you can further differentiate between items by using starkly contrasting colors for each. To do this, display the VBA Editor and then choose Tools, Options. In the Editor Format tab, change the color of each type of text. (Sure, you can format code in hot pink or fuchsia if you really want to.)

It's handy to indent lines of related code to set them off from comment lines (or other lines of code). In this statement, it helps to bunch the related lines together:



Change the font color of your macros' comments and code to make different parts stand out.

```
Sub InsertColumn()
'
' InsertColumn Macro
' Macro recorded 01/25/2002 by Linda Bird
'
' Keyboard Shortcut: Ctrl+Shift+I
'
    ActiveCell.Offset(0,
1).Columns("A:A").EntireColumn.Select
    ActiveCell.Offset(0,
1).Range("A1").Activate
    Selection.Insert Shift:=xlToRight

End Sub
```

You can manually indent each line of code by pressing TAB in the right spots throughout the code, but why would you want to manually indent when VBA has an Auto Indent feature? To make sure this feature is turned on, choose Tools, Options in the Visual Basic Editor and then click the Editor tab. Check the box for Auto Indent before closing the dialog box.

Now, in the Module Code window, press TAB to indent the first line of code. VBA indents the subsequent lines for you every time you press ENTER. You can also efficiently indent several lines of code by selecting them and then clicking the Indent button on the Visual Basic Editor's Edit toolbar. To push the lines back to the left side of the Module Code window, click the Outdent button on the same toolbar.

Finally, it's helpful to split long sections of code into several, shorter lines so that they are easier to read. When you *record* a macro, Excel automatically breaks long lines of code (longer than 70 characters or so) into multiple lines. In contrast, when you're writing code from scratch, you'll need to manually break lines if you want them to be reasonably readable. For example, you can place each argument in this procedure on a separate line:

```
Sub MakeValue()
'
' MakeValue Macro
' Macro recorded 01/01/2002 by Linda Bird
'
    Selection.Copy
```

```
    Selection.PasteSpecial _
      Paste:=xlPasteValues, _
      Operation:=xlNone, _
      SkipBlanks:=False, _
      Transpose:=False
    Application.CutCopyMode =
False

End Sub
```

Even if you split a line of code into several lines, the code will still execute as a single statement. Here's the rub: You need to break the lines following VBA rules to make the code run as a single statement, which is easy to do. To manually break a line for readability, type the statement and enter a space and underscore at the end of each line. Press ENTER to move the insertion point to the next line.

If you follow these tips, your code will run great and be easier on the eyes when you view it in the Editor.

Relatively Speaking

As you're well aware, in Excel you can record absolute cell references (or movements related to an absolute cell reference) or relative cell references. But when you record a macro, Excel doesn't know if you want to use absolute or relative movement. There's an easy solution to this common dilemma: You tell the macro recorder which type of selection you want to use. Start recording the macro and then click the Relative Reference button on the Stop toolbar to use relative cell referencing. Click the button again to turn it off.

Here's a quick example to illustrate this principle: Imagine you want to move the cell pointer down one cell from its current location, no matter where the cell pointer is originally located on the worksheet. Using the Macro Recorder, create a new macro called Down and assign a keyboard shortcut of CTRL-SHIFT-D. Start recording the macro. (You'll need to display the Stop Recording toolbar, so right-click the menu bar and choose Stop Recording from the list if necessary.) Click the Relative Reference button on the Stop Recording toolbar, press the Down arrow key, and then turn off the macro recorder. View the macro's code in the Visual Basic Editor by pressing ALT-F8, choosing the macro, and clicking Edit. The code should look similar to the following:

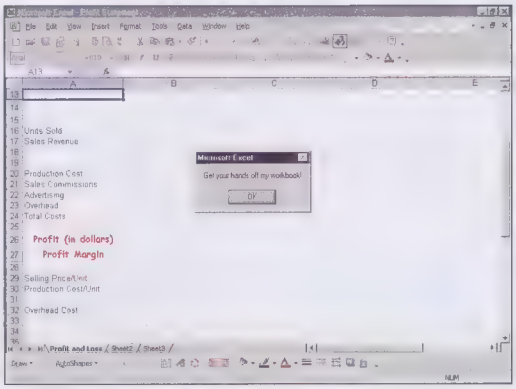
```
Sub Down()
'
' Down Macro
' Macro recorded 02/02/2002 by Linda
Bird
'
' Keyboard Shortcut: Ctrl+Shift+D
'
  ActiveCell.Offset(1,
0).Range("A1").Select

End Sub
```

Of course, there's not much use for a macro that simply moves the cell pointer down. But you can build on this simple scrap of code. For example, it's probably pretty common to move the cell pointer to the first blank cell at the bottom of a column of data. To perform that action manually, you'd typically press END and the Down arrow simultaneously to move to the last cell in the column with data, then press the Down arrow key to move down to the first blank cell. Instead of all of that, develop the following macro:

```
Sub EndDown()
'
' EndDown Macro
' Macro recorded 02/10/2002 by Linda
Bird
'
  Selection.End(xlDown).Select
  ActiveCell.Offset(1,
0).Range("A1").Select

End Sub
```



Pop-up messages are easier to create than you might think.

Put It All Together

When you're creating more complex code, don't feel like you have to tackle the whole thing at once. Think building blocks. You can create and individually test each snippet (block) of code and then combine it with other pieces of code to make a dramatic (and hopefully useful) application. So rather than trying to develop a long, killer macro, create several smaller macros and then make them run in sequence.

For example, say you need to create a report that involves importing an Access database into your Excel workbook, selecting the current data range, formatting the range, and printing it. You can create individual macros called Import, SelectRange, Format, and PrintRange. After you've created (and tested) the individual macros, create a "master" macro that runs them in sequence. To do this, start recording a new macro. (Let's call it Report.) Click the Run Macro button on the Visual Basic toolbar to display the Macro dialog box and then double-click Import on the list. Redisplay the Macro dialog box and double-click the next macro you want to run, and so on. When you're finished adding macros, turn off the recording of the Report "master" macro. The VBA code will probably appear similar to the following:

```
Sub Report()
      Application.Run
"Book.xls!Import"
      Application.Run
"Book.xls!SelectRange"
      Application.Run
"Book.xls!Format"
      Application.Run
"Book.xls!PrintRange"
End Sub
```

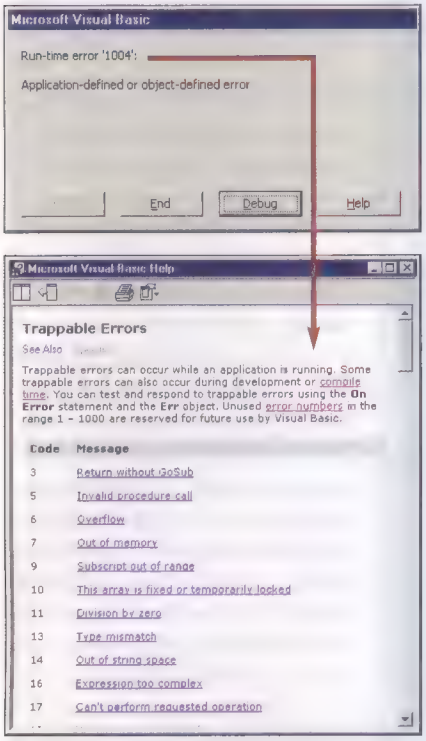
The master module (Report) runs each subordinate macro in turn. Simplify the macro by removing some of the repetitive text. Your result should look like this:

```
Sub Report()
      Application.Run "Import"
      Application.Run "SelectRange"
      Application.Run "Format"
      Application.Run "PrintRange"
End Sub
```

Message In A Module

You can program VBA to display messages for users whenever they finish a procedure. For example, you can create a message that tells your co-worker that a worksheet has been recalculated or the monthly report has been sent to the printer. This way, all a user has to do is acknowledge that he's viewed the message; he doesn't have to actually provide any information.

Messages are remarkably easy to create, but they'll impress your friends.



When troubleshooting problematic code, use the error number in the pop-up Microsoft Visual Basic dialog box to find a solution in the Trappable Errors section of Microsoft Visual Basic Help.

Make a simple one with an appropriate message for yourself. Display the Visual Basic Editor and type the following code in the Module Code window:

```
Sub Note()

    MsgBox "You're truly amazing!"

End Sub
```

You just type the statement (MsgBox) and the message that you want to display in quotation marks. And everyone around will think you're a programming genius.

Now test your code. Switch from the Visual Basic Editor to your workbook and choose Tools, Macro, Macros. In the Macro dialog box, double-click the Note macro to run it. If you were successful, the message box pops up on-screen, complete with your message. If you want to change the message, switch to the Visual Basic Editor and replace the original message with your new one, making sure to keep it within the quotation marks.

Troubleshooting Your Code

As you program in VBA, you might run into some problematic code. If you flip over to the Visual Basic Editor, you'll probably notice Syntax problems are flagged by red text in the Module Code window. (So anytime you see red, you'll know that you have some serious troubleshooting ahead of you.)

Excel includes a method you can use to troubleshoot macros that are behaving badly. To isolate the problem, slow the macro's execution down to the point that you can examine each and every step.

Step by step. Whenever you step through a macro's code, the VB Editor pops up on top of the workbook. But it's usually more helpful to display your workbook and the Editor in side-by-side windows, which will let you see the result of each line of code as it runs, helping you isolate ruinous code.

After tiling the windows, move your insertion point to the top of the code in the Module Code window in the Editor and press F8. This starts the Step mode, which executes each line of code blow-by-blow. Continue to press F8 to step through the code, noticing that the code is executed as the highlighted insertion point moves *off* of a line. If you hit a glitch, VBA displays a dialog box indicating the problem. You can choose to debug the problem or get more help by making the appropriate choice in the dialog box. And if you want to stop stepping through the code, click the Reset button on the Visual Basic Editor's toolbar.

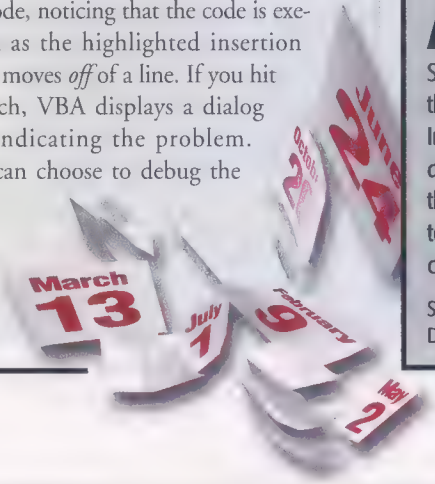
Instead of debugging your code from the Visual Basic Editor interface, you can step into code directly from the Excel workbook. Choose Tools, Macro, Macros. Then select the macro you want to troubleshoot and click Step Into. Press F8 to step through the lines of code and view how they execute. If you need to stop a running macro from continuing to go through its paces, press CTRL-BREAK.

Talk it out. Another formatting (and troubleshooting) trick is to temporarily convert problematic code into comments so you can evaluate it more carefully. This way you can run the rest of the code in the module without getting an error message.

To convert code into comments, you *could* place an apostrophe at the beginning of each line of code, but it's easier to display the Visual Basic Editor's Edit toolbar, select the lines of code, and then click the Comment Block button on the VBA toolbar. To change the comments back into executable code, click Uncomment Block.

You should now be able to make Excel (and your office cronies) sit up and take notice with your VBA and macro skills. Don't let it go to your head. CPU

by Linda Bird



Infinite Loop

January 25

1 . . . 2 . . . 3 Servers Ah, Ah, Ah

According to the Internet Software Consortium's Internet Domain Survey taken in July 2001, there are more than 125,000,000 hosts connected to the Internet. There are 86,400 seconds in a day, which means it would take more than 1,446 days, or roughly three years, to contact each host on the Internet if you contact one host per second.

Source: Internet Software Consortium's Internet Domain Survey (www.isc.org/ds).

Warm Up To Penguins

Multiplayer Web Gaming With Xbox & Linux

In February's issue of Computer Power User, *we outlined the basics of installing various Linux distributions. This month, and in months to come, we'll delve into more complex Linux issues and projects. Here, we focus on networking an Xbox using a Linux PC.*

You might not think a PC running Linux has any connection with Microsoft's Xbox, but you can link the two together (literally and figuratively) to extend the Xbox's capabilities, as we'll address later.

Although the games available for the Xbox at rollout were interesting and addictive and showed off the console's GeForce graphics capabilities very well, all is not happiness for Xbox gamers. The ability to easily network for multiplayer gaming was left unfinished. Although simple in theory, networking Xbox consoles together in practice can be a nightmare. Naturally, the Linux community loves this kind of problem and stepped in to fill the void.

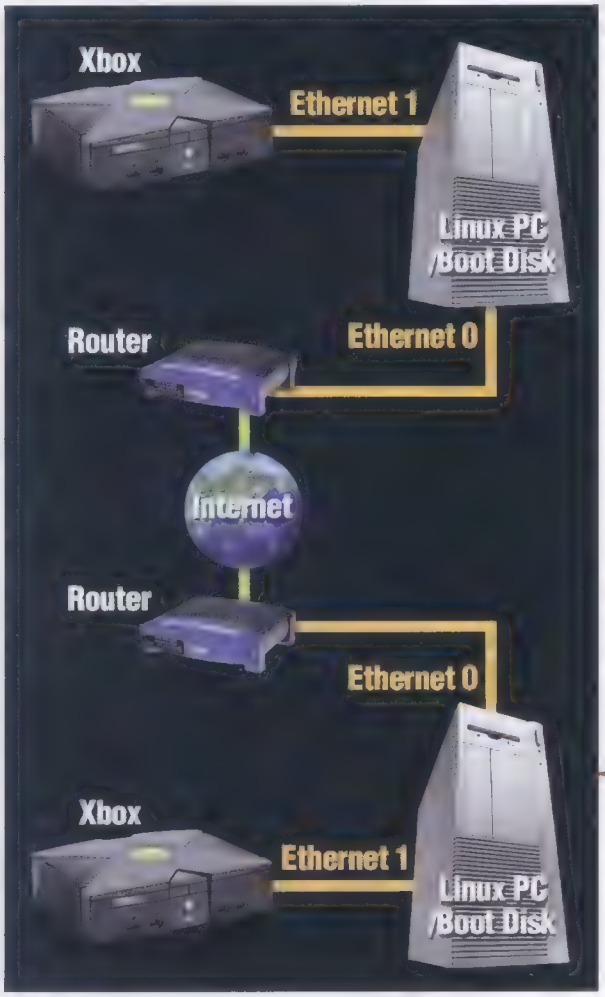
Unless you've been hiding in a cave in Afghanistan, you know Microsoft's Xbox has been taking the game console market by storm. Microsoft touts it as the leading advanced game console on the market. If the Xbox actually is, it's due in part to a clever blend of current PC technology and the console's simplicity, as well as its future expandability.

While the Xbox is not a true PC, it does have most of the guts of a typical gaming PC; its OS is a heavily modified Windows kernel. Game developers we talked to like working with the Xbox because much of the task of writing for the console is similar to writing games for the PC, and porting games from PC to Xbox, and vice versa, is relatively easy. In addition, Microsoft doesn't charge fees to become a developer for the Xbox, unlike other consoles makers that charge hefty up-front licensing fees, plus a percentage of each game sold. The Xbox Development Kit is readily available to anyone, unlike the kits for the Nintendo Gamecube and Sony PlayStation.

Connect That Doesn't Effect

When designing the Xbox, Microsoft built in an Ethernet connector, although it's not functional for networking using the current Xbox OS. So far, Microsoft hasn't released any patches to the OS or add-on hardware that takes advantage of the port. Obviously, Microsoft allowed for a networking environment right from the beginning, both in letting multiple Xbox consoles connect directly for multiplayer gaming, as well as connecting players via the Internet or a dedicated network service (like Sega's for the Dreamcast). Many games in release, and more to come, have multiplayer capabilities built in, so networking looks to be an integral part of Microsoft's marketing strategy.

As it is, the Xbox can connect multiple consoles together in a couple of ways, but the connections have to be direct between two machines or through a LAN. The Ethernet port (called System Link by Microsoft) reverses the standard Ethernet pinouts, so crossover



With two network cards installed in a PC running Linux, you can connect an Xbox via Xbox Gateway software installed on the PC to get out to the Internet or a network. (Illustration courtesy of XboxGW.com.)

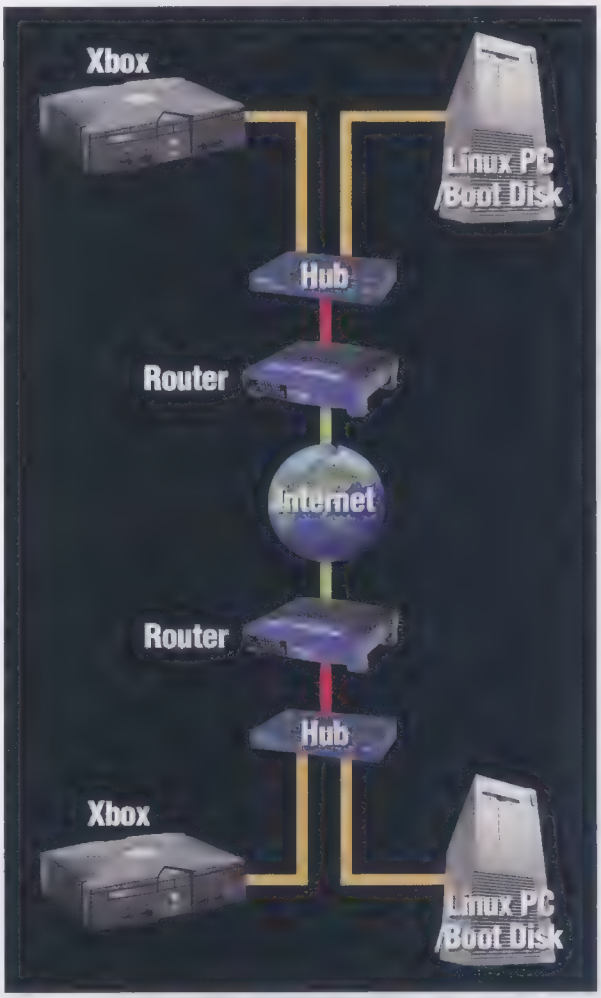
cables are needed. However, each Xbox has to have a TV, so playing a four-player Halo game means four Xbox consoles, four TVs, four crossover cables, and a network hub—a highly unlikely occurrence.

Alas, because Microsoft had to get the Xbox out the door in time for Christmas, it didn't complete the coding for support of multiplayer gaming via the Internet. The Ethernet port remained a tantalizing glimpse of future expansion, which the Redmond crew is promising later this summer. Instead of letting such an opportunity go to waste, a number of programmers immediately stepped in and tried to figure out how to connect the Xbox Ethernet port to the Internet to allow for multiplayer gaming. Various schemes have been tried in the last couple of months with differing degrees of success, but one approach that uses Linux running on a PC is fully operational, offering the ability to tie Xbox machines together over a LAN, VPN, or the Internet.

In theory, connecting Xbox consoles directly through the Internet should be fairly simple. If you treat the Ethernet port on the back of the Xbox like a standard PC's Ethernet port, all you should need is a TCP/IP stack. It's only when you look at the details in the Microsoft Xbox Developer's Kit that you realize what a nightmare networking Xbox consoles can be.

To begin with, you need to have the BCP (Bridge Control Protocol) running on top of PPP (Point-to-Point Protocol). That's not too difficult, and it is possible to construct such a protocol stack for LAN-only play, but it gets much more complicated when you consider gaming over the Internet. Each Xbox playing the same multiplayer game needs to appear to be connected directly together, so the IP address for each Xbox has to make the consoles appear to be on the same subnet. This requires IP address translation and a VPN configuration. So, BCP and PPP need to run in the L2TP (Layer 2 Tunneling Protocol). Another protocol that provides VPN capabilities has to handle that packet so the consoles appear to be on the same subnet.

If this approach sounds a little daunting, it is. So far, only expensive commercial software packages provide L2TP over the Internet to simulate a VPN. As most programmers will tell you, developing these layered protocols and getting them to run at a reasonable speed is difficult. Simple calculations of network traffic required to support the layers of networking protocols show that bandwidth will be a major problem for this kind of setup under even ideal conditions. It's highly unlikely a dial-up 56K connection will provide enough speed for any of the simpler multiplayer games, and it would be almost impossible for highly interactive games, such as Bungie Studios' Halo. Even over a broadband connection, the traffic will be considerable and won't support many players. Fortunately, though, there is a Linux solution for frustrated Xbox owners.



You can use a single network card to connect the Xbox and PC running Linux through a switch. There is generally more network traffic using this configuration approach, but it will work. (Illustration courtesy of XboxGW.com.)

The most successful Xbox Internet networking approach currently available and already functional is the Linux-based Xbox Gateway software. The Xbox Gateway is designed to let Xbox players network their machines together in a roundabout way using Linux running on a PC. Available at www.xboxgw.com, the Xbox Gateway works by connecting an Xbox and a Linux-based PC together. The Linux OS handles the multiple networking protocols required for the Xbox, leaving the Xbox free to handle game functions.

There are several ways to set up the Xbox Gateway, depending on how you want to connect the Xboxes together. The most common configuration has an Xbox talking to the Linux-based PC through the Xbox's Ethernet port into a NIC on the Linux PC. From the Linux PC, a modem connects to an ISP or an Ethernet cable from another NIC connects to a router (and then the Internet) or a hub with other Xbox-PC combinations also attached. Because of the direct connections between the Xbox and the PC, a crossover Ethernet cable must be used. An alternative configuration that requires only a single NIC in the Linux PC has both the PC and the Xbox connected through regular Ethernet cables to a hub, which then connects to the Internet.

The Xbox Gateway software runs only under Linux so far, primarily because developing for Linux is easier and the networking capabilities needed to tie the

Xbox consoles together are already in place. (A Windows port is underway, but release is not expected soon.) Installing the Xbox Gateway software is easy enough if you are familiar with Linux, but if you've never touched Linux before, the process can be a little daunting. There are many configuration options with which to deal, and a great deal of experimentation, and hence frustration, is likely. (For details on software requirements, see "Requirements For Running Xbox Gateway.")

Because of the freeware nature of the Xbox Gateway software, no official support is available for the product. The software's authors, identified on the Xbox Gateway site simply as Rooty and Tzar, have left no contact information other than e-mail addresses. However, a lot of online newsgroups and a couple of IRC channels are starting to provide user support for the gateway, and some of the Web-based Xbox fan sites, such as www.xboxnet.net, are offering help files or step-by-step guides to using the software.

Naturally, we wanted to see how well the Xbox Gateway package worked, so we gathered eight Xbox consoles, eight PCs, and some networking gear. We used the Xbox Gateway software first on a dedicated LAN and then over broadband Internet connections. The quickest summary of our research is that not all supposedly multiplayer games appear to work under Xbox Gateway. The Xbox Gateway software authors have stated that the only game officially tested and approved is Halo, but several others, including Tony Hawk's Pro Skater 2X and NASCAR Heat worked, for us. In theory, if the Xbox indicates the game has System Link enabled, it should work over the gateway software.

Not all is rosy in the Xbox Gateway world, of course. To begin with, the nature of the software and the packets coming in for the Xbox require that the Linux machine accept all incoming traffic. No firewall or filtering software can be in the way for the ports that the software uses. This type of setup (called promiscuous mode) is an obvious security issue, so an Xbox-Linux PC setup should not be connected to other machines that need protection from intruders.

The other problem with the Xbox Gateway approach is the bandwidth required. Playing a two-console game of Halo over a 56K modem was impossible. A high bandwidth connection, such as DSL or cable modem, is required. Even then, you'll quickly find bandwidth used up. On a cable modem, we managed to have three Xbox consoles participating in a Halo game, but latency and temporary screen freezes started to appear as the action heated up.

Worth The Effort?

Is it worth the effort to use Xbox Gateway? If you want to play head to head with other Xbox gamers over the Internet, this is (for now) your only option. Because Linux is required, you obviously need to have a spare PC available, as well as network connections and Ethernet cables. A bootable Linux diskette can be used, so you don't need to dedicate a PC to the Xbox gaming.

A quick scan of the Xbox fan sites shows dozens of games available through other user's servers, so you just have to find a game in the process of getting started and join in. As long as you have broadband Internet access and a lot of patience for the occasional screen freeze, your Xbox can pit you against other players. And that's what the promise of Xbox offers. CPU

by Tim Parker

Requirements For Running Xbox Gateway

So you want to go head to head with other players in Halo. You've decided not to wait for Microsoft to release the official networking code, and you've got a PC handy. Ready to try Xbox Gateway? Here's what you need:

To start with, you'll obviously need an Xbox console and a System Link-enabled game. You need a broadband connection to the Internet if you want to play outside a dedicated LAN. You also need a PC that can run Linux. Because Linux runs on pretty much any machine from an 80386 up, this doesn't have to be a state-of-the-art workstation; the old clunker you're storing in your closet will work fine.

A Linux distribution is also obviously required. You can download several versions from the Web, but the best solution is to drop $50 or so and pick up a complete distribution in a book or computer store. You'll get all the software you need, as well as documentation. Popular Linux distributions include Red Hat, SuSe, Mandrake, Corel, and Caldera OpenLinux. Although the Xbox Gateway software is designed for RedHat 7.0 or above, we ran it successfully on our test PCs using both SuSe 8.0 and Mandrake 8.1 Linux without any problems.

Make it work. Install Linux on the PC and configure at least one network card in the machine. You'll also need to configure a connection to your broadband ISP and have that all working prior to worrying about the Xbox Gateway software. Once your Linux PC is ready, install Xbox Gateway. Although the menus and prompts are simple character-based affairs at the moment, you can install the Gateway software quite easily if you're patient and willing to experiment a bit with the available options.

You can use a floppy-based installation if you want to use the PC for Windows, for example, by simply booting off the floppy when you want to use the Xbox Gateway software for gaming. Configuring the floppy properly takes a bit of practice, but it is possible.

Once the software is set up properly, your Linux machine goes into either server mode (which hosts the game; one server per game is required) or is a client of a server. The Xbox Web sites and support forums often have announcements from players indicating the IP address of their server and when they want to play. Simply monitor these newsgroups or Web pages and pick a game you want to play. Drop in the proper IP address in the Xbox Gateway software, and you should be gaming. ▲

KILLER HARDWARE TIPS

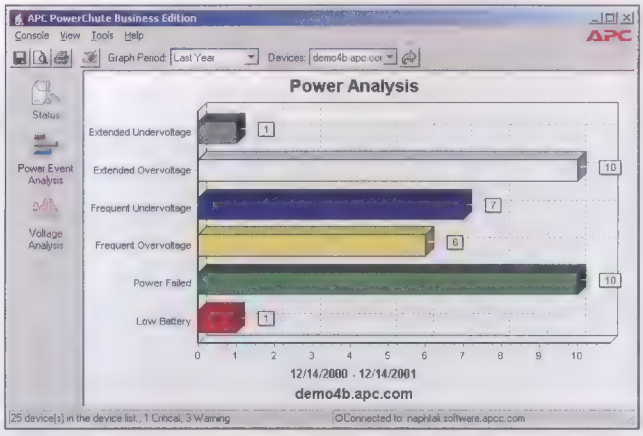
Too Cool To Follow Rules

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IT IF MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS and tricks that just might help your system look cooler and make you more productive.

The Lap Of Luxury Is Flat, Smooth & Cool

The better the contact is between your heat sink and CPU, the better job it can do dissipating heat. If the sink's contact surface is irregular or curved, it won't absorb the maximum amount of heat from the processor. Flattening, or lapping, the heat sink can maximize that crucial contact area, keeping the processor cooler.

"Optimal heat transfer occurs when both mating surfaces—the heat sink and the chip—are perfectly flat," says Scott Madison, an MCI Worldcom engineer and author of an article on lapping (www.sysopt.com/articles/lap). "Generally, the heat sink is the part that benefits the most from lapping. This is largely due to the way heat sinks are manufactured. The manufacturing process often introduces variations in the mating surface leading to forms that are convex, concave, or with scratches and grooves. All of these hinder the mating surface and heat transfer."



American Power Conversion's free PowerChute Business Edition software shows you graphs that depict the power hiccup trends of your PC. Such programs may also include e-mail notification if power goes out.

You can lap your heat sink by hand using sandpaper, which can take hours, or do it more quickly if you have access to a machine shop. "You can tell the process has been completed correctly when the surface of the heat sink is perfectly flat (or nearly so) from edge to edge and has a glass or mirror-like finish," Madison says.

Although thermal paste can aid heat transfer by filling in microscopic variations between the mating surfaces, paste often won't fill in the gaps caused by a convex or concave heatsink surface. In fact, too much paste may decrease the amount of heat transfer.

You can also lap the chip you're trying to cool, but this is risky and can destroy the chip. You should only attempt to lap a CPU that doesn't directly expose the chip core. Older processors—Intel up to and including Pentium II and AMD up to and including the K6-3—and chips on video cards and motherboards are constructed in a manner that doesn't expose the core. "This is also true of the newest Pentium 4, which has a heat transfer cap," Madison says. "Since the chip core is not directly exposed, lapping can be done with much less risk than on chips based on the Pentium III/Celeron and the AMD Athlon/Duron designs."

Is Your Computer Leaking?

Your computer is broadcasting information about you, and government goons in a van nearby are eavesdropping. Sounds like a plot from a bad cracker movie. Far-fetched but not impossible.

As you use your PC, it emits radio signals others can capture and decode to reveal information, ranging from simple activity levels to remotely copying keystrokes or capturing monitor information. This is according to "TEMPEST in a teapot" (www.eff.org/Privacy/Security/tempest_monitoring.article), a paper about reducing the susceptibility of PCs to remote monitoring.

Written in 1993, the information remains relevant. "Basic physics haven't changed too much in the last decade. I believe the main idea is still valid that radio frequency interference prevention as a side effect limits any signal intelligence that could be derived from the broadcast," says Grady Ward, author of the paper.

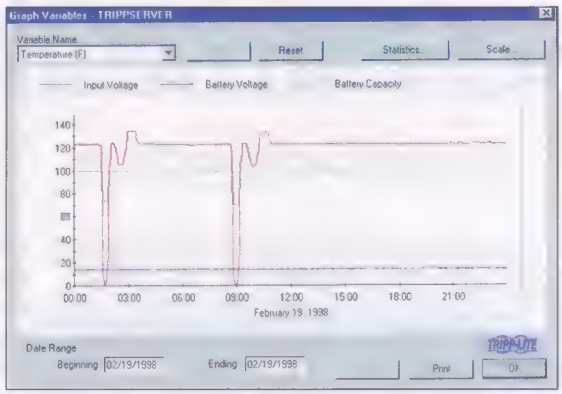
"With everything from 802.11b to IrDA-enabled cell phones, eavesdropping is much easier now," says Ward. "I believe that this has been an intelligence windfall to certain organizations who have no scruples about covertly collecting information, then selling, trading, or blackmailing with it."

Ward offers these tips and information to keep work from prying eyes and ears:

- Use Class B computers and peripherals, which have the least amount of

spurious emissions. (Class A is a less stringent standard allowed in business equipment.)

- Don't operate a PC with its cover off. Keep slot covers in place.
- Use shielded cables for all system connections, and make the cables as short as possible.
- Use an EMI (electromagnetic interference) filter to block signal radiation from power cords into house wiring.
- Use phone jack EMI filters to shield your telephone, fax, and modem lines, preventing them from retransmitting your computer's radio-frequency interference signals.
- Use ferrites to prevent EMI from escaping on your cables' surface. "Ferrites are magnetic materials that attenuate the EMI by causing it to spend itself in heat rather than continuing down the cable," according to Ward's paper. "Every cable leaving your monitor, computer, mouse, keyboard, and other computer peripherals should have at least one ferrite core attenuator."
- Don't use wireless peripherals.
- Don't rely on the encryption built into your Wi-Fi router. Supplement built-in security with stronger encryption tools.



Combine a microprocessor-controlled UPS with software on your PC to monitor the electricity, battery, and other data only a geek would want know.

Take A Power Trip

If your electricity is prone to outages, you need a UPS or battery backup for your PC to give you time to save your work and shut down when power outages occur. Having a big PC battery is useful, but the geek fun really begins when you connect a UPS to a serial or USB port.

By letting the PC monitor the UPS, you can set it to automatically shut down when the power's out and the battery is waning. Even today's cheapest UPSes include a data port. You simply need a standard serial or USB cable to connect the UPS to the PC.

With a more expensive, microprocessor-controlled UPS, you can monitor the power and internal workings of the UPS via graphs of line voltage, battery load, and operating temperature.

Win2000 and XP have basic UPS monitoring and shut down functions. You can use more advanced software from a UPS manufacturer. American Power Conversion offers Power-Chute software (www.apcc.com). Tripp Lite has PowerAlert (www.tripplite.com/software). These programs can add features such as outage notification via e-mail or pager and server application shutdown. Some high-end UPSes include load shedding, which prioritizes devices, turning off nonessential systems first.

A Clean Computer Is A Happy Computer

One way to make your computer run cooler is surprisingly low-tech: clean it.

When Alastair Price, an avionics engineer and amateur case modder, opened a friend's PC to install an upgrade, he discovered dust, dead bugs, and other sundry grime. He removed all components, cleaning them thoroughly. Afterward, the CPU ran 10 degrees Celsius cooler.

The key to this cooling is disassembling and cleaning the CPU-heat sink-fan assembly. Removing the accumulated dust around the heat sink fan allows for better airflow and provides for more efficient cooling. Price published a Web page on the process at www.unique-hardware.co.uk/howto.asp?howto=dustingpc.

"The 10 degrees difference was just a personal observation after I had carried out the cleaning techniques on my own PC. I can't guarantee the same temperature difference will be found by other people. However there seems to be a significant temperature drop after the heat sink fan has been cleaned. It could be as little as 2 or 3 degrees or as much as 10 degrees," Price says.

The more fans your case has, the more grime it collects. As long as your computer is open, clean the motherboard, cards, drives, and other parts. This won't make your computer run cooler, but it will make the components last longer, especially those with moving parts. A vacuum cleaner, small paintbrush, and a little time are the most important tools for cleaning your PC.

A clean PC "cuts down on downtime, repair bills, and minimizes health risks," says Dennis Orloff, the founder of ComputerBath (www.computerbath.com). "The best prevention is to just dust around the computer. Make sure all the dust is removed and guess what: If you remove the dust from outside the computer regularly, you won't have to clean it inside." CPU

by Kevin Savetz

Infinite Loop

DVD For Me, And You, And You . . .

Standalone DVD players are hot—so hot that DVD players outsold VCRs for the first time in September 2001, according to the Consumer Electronics Association. In 2001, 13 million players were sold; this year 16.25 million are expected to be sold. How far has DVD come? In 1996, Time-Warner predicted that 10 million households would have DVD by 2002. In 1997, 400,000 players were sold in the United States and only 900 DVD video titles were available; by 2000, more than 10,000 titles were on shelves.

Additional source: www.theoracle.cx

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Technically Speaking

An Interview With James Von Ehr, Zyvex Founder, President & CEO

Take your pick of pioneers: Einstein, the Wright brothers, Galileo. All were scorned for their avant-garde ideas. Not until their dreams became reality did these visionaries receive the credit and historical respect they deserved.

James Von Ehr II may be to nanotechnology what the Wright brothers were to aviation before Kitty Hawk. Inspired by the work of K. Eric Drexler and possessing enough scientific knowledge to believe that nanoassemblers are indeed feasible, Von Ehr has used his personal fortune to hire some of the greatest minds in nanotechnology and found Zyvex. If Zyvex succeeds, Von Ehr's vision and conviction will likely change the lives of most everyone on Earth and, in a way, transform Earth itself. (See the Spotlight section starting on page 50 for more articles on nanotechnology.)

by William Van Winkle

CPU: When you started Zyvex in 1997, you forecasted a 10-year schedule to create a nanoassembler. Are you still on track for that?

Von Ehr: It is not progressing quite as fast as I'd hoped. At this point, that would require us to get it in about six years, and it's probably a little further out than that.

CPU: Is there a revised estimate?

Von Ehr: It's one of those things that always seems 10 years away. We do expect to be able to assemble nanoscale MEMS [microelectromechanical systems] within five years—in other words, to have a parallel nanoscale assembler that will handle parts down to probably quarter-micron geometries. Obviously, that's still a long ways away from a molecular-scale nanoassembler. It still is conceivable that our top-down and bottom-up groups will come together in the next five or six years, but I think at this point it's safer to say it's further out than that.

CPU: Obviously, when you are dealing with machines this small, it takes legions of them in order to fabricate material on any scale. So how do you get around not having self-replication, or are you not focusing on that aspect of the problem?

Von Ehr: We certainly need what we are calling exponential assembly, where we can instruct manipulators to build other manipulators. I think when people think self-assembly, what they often think about are little nanorobots running around copying themselves. We simply don't need that to commercially develop nanotechnology. The way I would envision it is more along the lines of you have machine A that cranks out machine B and perhaps machine B cranks out machine C and then machine C makes your product. So machine A is running at a slow rate that is cranking out Bs. Every day each B produces 10,000 more Cs. The geometry

and the mechanisms in A, B, and C may be wildly different. C is what you use to manufacture your product.

CPU: Is it futile to ask how assemblers might someday be used? Would one be better off asking how they could *not* be used?

Von Ehr: I am a huge believer in the power of human ingenuity. What we are trying to do is enable more people to exercise more creativity and change the economics of the products that we are building. Today, if you try to embed a microprocessor, sensors, actuators, and a power source into an object, you have a certain minimum size and cost. You aren't going to put a transponder into your pen so that you can keep up with where it is. You aren't going to put little motors into your chair so that it can move away from the vacuum as you are vacuuming the carpet. It's just too expensive.

We can change the economics and manufacturing by building things at the molecular scale. What goes into the manufacture of the pen? Even if it's a 19-cent BIC pen, someone had to make the ball, the metal that has been mined somewhere, smelted and refined, forged into that shape. Someone had to make the ink out of chemicals, the plastic body from refined petroleum. Now, the same number of atoms could be arranged in a different manner and instead of being in a bulk plastic material, if those atoms were arranged into a stronger form, the shell could be thinner. We could take the atoms left over and use those to make a microprocessor or a signaling device or a transponder or whatever some creative person thinks a pen ought to have in it. And it should cost no more from a materials standpoint than a current pen.

CPU: What are some of the environmental ramifications of nanotechnology?

Von Ehr: There are a lot of people concerned about CO^2 in the air right now. When I think of CO^2, I think, hmm, interesting construction material. Trees take it out of the air, throw away the oxygen as a waste by-product, and build more trees out of the remaining carbon. Why can't we do the same thing? Photosynthesis isn't very efficient; it's about less than 1% efficient in terms of the conversion efficiency of solar energy to product. We could probably do better than that. We are already doing 25% efficiency with solar cells converting light to electricity. If we really engineer a good system, we could probably take the CO^2 out of the air, build useful things with it, and now all of a sudden instead of being a pollutant, it's a valuable substance to mine. The wonderful thing about that is it's available to every country on the planet regardless of what sort of minerals you have in the ground or access to oceans you may have. Just put up a manufacturing plant, take CO^2 out of the air, and do something with it.

CPU: Is there a risk involved in doing too much of that, having CO^2 depletion?

Von Ehr: I could envision the same people who are wringing their hands about too much CO^2 today in 50 years wringing their hands about too little CO^2, which is why I chuckle when people make projections about what the climate is going to be in 2070. It's as foolish as people at the turn of the 20th century wringing their hands about how much horse manure would be in the street, not knowing cars were coming. Certainly, there is no question in my mind that long before 2070 we are going to have nanotechnology and the ability to do this.

CPU: Where will nanotechnology be in your life by 2030?

Von Ehr: Well. I take my morning nanovitamin pill that has some sort of nanotechnology. I don't know if it has nanomachines, nanoparticles, but it has some sort of nanotechnology in it and that pill is keeping me healthy, even though I'll be 80 years old. I may go down to my office and turn on my wall display. I'm probably communicating over the Internet IV, and I've got a gigabyte data link to a camera on top of a mountain somewhere, so I'm doing my morning exercise by looking out over some nice vista. My desktop computer has more horsepower than all the computers in the world right now put together. Nanotechnology is going to be how Moore's Law continues. In fact, it may even accelerate. I'm going to go way out on a limb here and say that we'll solve the last mile problem and all have high-bandwidth connections to our homes. That's probably the riskiest projection of all.

CPU: You've seen movies about the well-intentioned scientist who explores just a little too far for humanity's good. Do you worry about being remembered not as the man who revolutionized the world but the one who doomed it?

Von Ehr: No. If the world were doomed because of nanotechnology, there wouldn't be anyone to remember for one thing. I think it's vital that we develop nanotechnology because the good guys have to get there first. If the good guys don't develop it, the bad guys do. Then we have a very unpleasant scenario. I envision nanotechnology as being a similar kind of thing to electricity. Electricity can be bad. You can shock yourself and die. But we don't shy away from electricity and say, "Oh, it's this evil death thing." We've learned how to use it just like we learned to use fire. Nanotechnology will be embedded into the fabric of society in a similar way.

Certainly, people will abuse nanotechnology. They will abuse everything. I think that we have to realize that the good is huge. The health benefits alone are going to be amazing. The ability of it to help with material scarcity of things is going to be incredibly transformative. I don't put much credence in the dark-Hollywood view of things. They are there to entertain, not to provoke thought. CPU

To read our entire interview with James Von Ehr, go to www.smartcomputing.com/cpumag/march02/vonehr.

What's Cooking . . .

Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

There's A Flesh-Eating Robot In The Garden

Tomato plants rejoice! The SlugBot captures slugs and uses their decomposing carcasses for fuel, creating a self-sufficient system with no outside energy needs. (Photos copyright of the University of the West of England.)

Slugs are one of a gardener's worst enemies. They invade leafy plants with slimy tenacity, damaging crops. Perhaps if Dr. Ian Kelly and researchers at the University of the West of England (www.ias.uwe.ac.uk) are successful, slugs will soon be oozing for their lives. SlugBot, a prototype robot, is due to enter field-testing early this year.

SlugBot is a 2-foot tall machine on four wheels, highlighted by an arm that reaches out with pinchers to grasp slugs. Optical recognition and color filtering help the robot discern slugs from dirt and vegetation. SlugBot can deposit as many as 10 slugs per minute into his innards. When SlugBot gets low on power, it uses GPS and an infrared localization system to return to its home base and deposit the mollusks into a "static fermentation station." Here, bacteria go to work decomposing and fermenting the slug corpses, using the resultant gas to charge a fuel cell that sends SlugBot back into the wild.

"Even the simplest animals are self-sufficient, both in terms of information processing and energy," says Kelly. "The aim of this project is to build a robot with animal-like self-sufficiency in both information and energy. We don't expect to be able to match the speed and performance of a cheetah chasing a zebra within the time frame of this project, so we decided to chase something slightly slower." ▲

Computer Vision Comes Into Focus

Following the terrorist attacks of September 2001, some private and public airports and organizations are installing computer vision systems supposedly capable of picking out faces of known terrorists and reporting them. For better or worse, there's plenty of evidence that contemporary facial recognition systems are highly inaccurate.

"Anyone who claims that facial recognition technology is an effective law enforcement tool is probably working for one of the companies trying to sell it to the government," states an American Civil Liberties Union Web document. "A study by the Department of Defense found very high error rates even under ideal conditions, where the subject is staring directly into the camera under bright lights."

Part of the problem includes lack of industry-wide development tools and insufficient hardware. Until now, recognition systems have functioned in 2-D. In December, Intel released OpenCV 2.1 (OpenSource Computer Vision Library 2.1), a free collection of more than 500 imaging functions Intel hopes will spur widespread development. OpenCV 2.1 is somewhat revolutionary in the computer-vision field because it allows for stereoscopic input; computers will be able to perceive depth as humans do.

More accurate facial recognition is one of the first areas OpenCV 2.1 will be applied to. Similar fields are lip reading (remember HAL's capacity for this in "2001"?) and sign language recognition. Justin Rattner, director of microprocessor research at Intel Labs, looks forward to toys that react to a child's movements and security systems that monitor for life-threatening behavior, such as someone drowning in a pool or, in the case of an attempted airline bombing last December, a passenger lighting a match.

Intel won't immediately profit from OpenCV 2.1, but future facial-recognition apps will hinge on processing power, such as that anticipated in Intel's 10GHz chips due by 2007. No one is ruling out the possibility of SSE-like hooks in next-generation CPUs and apps specifically designed to accelerate biometric processing. ▲

by William Van Winkle

Keep A Cool Tool

If you've ever operated a notebook on your lap for 20 minutes or so, you know heat remains a problem in today's technologies. More circuits and faster speeds in the same space mean more heat to disperse. Apart from lowering voltage, advances in coping with heat have been painfully few.

Associate professor Suresh Garimella and his research team at Purdue University may have a solution. Conventional fans, such as those in notebooks, are bulky and loud and produce electromagnetic interference. Garimella's design relies on waving tiny fan blades up to 1 inch long. The fans wave back and forth through a piezoelectric ceramic attached to the blade, rather than a typical motor mechanism, which would simply consume more power and create more heat through friction. As current is applied to the ceramic, it expands, moving the blade one direction. As the current is removed, the ceramic shrinks and waves back. (This sort of piezoelectric motion is the foundation of Epson's color inkjet printing method.)

Purdue researchers note that experiments have shown their nearly silent piezoelectric fans, used in conjunction with a standard fan, reduced interior notebook temperatures by up to 8 degrees Celsius. The fans run on just 2/1000ths of a watt versus 300 milliwatts for a conventional fan. Garimella expects that the design could reach commercial products in possibly two years. Soon, the group will engineer fans only 100 microns long for mounting on a CPU. ▲

Developing Mother Nature's Processor

Professor Ehud Shapiro, standing, holds a test tube that contains a trillion biomolecular computing machines. Yaakov Benenson, sitting, holds test tubes containing the software molecules.

Study a cell in your body and you'll find a computational powerhouse capable of storing vast amounts of data and conducting chemical processes able to compute a given value. Since Leonard Adleman of the University of Southern California originally used DNA to solve a simple math problem in 1994, a niche of scientists has been racing to apply DNA to far larger problems. Professor Ehud Shapiro and his team at the Laboratory of Biological Nanocomputers have taken the most recent step.

Data stored in DNA is made of four chemical bases: adenine, thymine, cytosine, and guanine (A, T, C, and G). Each base can chemically bond with others when stimulated by certain enzymes. Other enzymes can detect, or read in a sense, the resulting conjunctions. The experimenters used these mechanisms to conduct several computations to see, for example, if an input molecule with an encoded list of 0s and 1s has all of the 0s preceding the 1s or whether the input string starts with a 0 and ends with a 1. This sounds overly simple, but determining the answer involves sorting through all possible variables. With conventional computing, this can be incredibly time-consuming. With DNA computing, Shapiro notes, one trillion tiny computers working in parallel could fit into a single drop of solution, performing billions of operations per second.

Not even Shapiro believes DNA computing will replace silicon, but it might be used in biological settings. With proper stimulation, an engineered cell or simple organism might perform a task, such as self-destruct if invaded by a virus. If technologies develop so biological computing can interface with silicon, the potential for storing and retrieving data is phenomenal. ▲

Hear The One About The Wisecracking Computer?

The most common metric for assessing computer "intelligence" is generally considered the Turing Test, in which a computer can fool a human into thinking the computer is human, too. But what if a computer is smart enough to make you laugh? Does that constitute intelligence?

This is one question emerging from the Laugh Lab (www.laughlab.co.uk), a collaboration of Dr. Richard Wiseman of the University of Hertfordshire and the British Association for the Advancement of Science. Ostensibly, Laugh Lab is the search for the world's funniest joke (read the joke in "Fringe" on page 78), but below this, the study is gaining data about the nature of humor, ranging from gender and national humor preferences to exposing the elements of humor itself. Site visitors contribute or rate jokes and supply basic personal information. As of December 2001, users have submitted more than 10,000 jokes, which more than 100,000 people from more than 70 countries have rated.

Interestingly, though, 10 UK scientists each presented a joke at Laugh Lab's launch. Five jokes were computer-generated. Of these, four flopped, including one stinker scoring third from last: "What kind of line has sixteen balls? A pool queue." One joke, however, beat more than 300 human jokes: "What kind of murderer has fibre? A cereal murderer."

Not rolling-on-the-ground funny, but not bad. The impressive part is that the computer was able to analyze and correctly use double meaning of homonyms to produce a comedic effect. To date, though, systems lack the human ability to distinguish degrees of humor or even humor. ▲

ine laughing at a computer instead of cursing it. The Laugh Lab is studying variables surrounding humor, including the success of jokes written by computers.

Q&A With Bob Evans

Bob Evans has spearheaded several movements in the computing field, having developed leading-edge technology himself and now serving as a venture capitalist, spawning other imaginative ventures. Evans is a winner of the National Medal of Technology (1985), the nation's highest honor for an inventor. He has held a series of senior leadership positions during his 33-year career at IBM, including president of one of its divisions, the IBM Federal Systems Division.

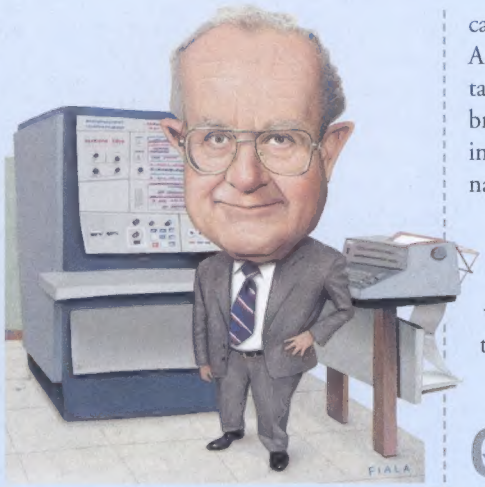
Evans is credited as the inventor of IBM System 360, the breakthrough business computer of the 1960s and 1970s. Evans has also served as founding president of Vanguard International Semiconductor, founding president of Interactive Voice Systems, and venture partner at Hambricht & Quist. He is currently chairman of Cambridge Research Associates, developer of simulation software used by U.S. Navy and U.S. Air Force pilots to practice bombing runs over Afghanistan during the war on terrorism. The following is an excerpt of our recent conversation with Evans.

Q Tell us about the software, Power Scene, being developed there at Cambridge for the war on terrorism?

EVANS: This is real-time image processing software that I believe by lots of measures is the best in the world. I'll tell you, NATO will tell you that. Power Scene is absolutely key to air operations in NATO. It was used in Bosnia-Herzegovina, Kosovo, and now in Afghanistan.

Q How does it work?

EVANS: Satellites fly around the earth, doing little digital stripes of photography. A stripe is maybe 15 miles wide in actuality. That data is sent to Cambridge. The elaborate software renders that into 3-D



views of the territory. A pilot can sit in a chair at a single workstation and, with a stick and throttle, fly the territory at 100 feet, 1,000 feet, or 30,000 feet. The pilots can fly at 100 knots. They can fly at Mach 3. They can see rivers, roads, lakes, forests, and villages. Pilots can "fly" the territory that they later intend to fly and do so very accurately.

Q In what way does the military use the software?

EVANS: Well, in Kosovo, it was used for all mission planning. Then each pilot flies a mission and spends hours on Power Scene before they go. So when they got in the plane and went off, they knew where they were at all times. This software is extremely powerful. Toward the end of [the conflict in] Yugoslavia, it began to be used for targeting.

Q How was that done?

EVANS: Slobodan Milosevic was sending tanks down into Bosnia under cover of weather. Milosevic's men would then come out of the tanks and pillage the town, rape the women, kill the men, and burn the buildings. NATO wanted to find these tanks in the worst way. They used Predator drones, with side-viewing cameras, flying at 10,000 feet, to scan. And son-of-a-gun, they found some tanks. The raw data was sent to Cambridge. Then the Power Scene software inserts the latitude and longitude coordinates. This is then sent to F-16s. They use a system called JDAM (Joint Direct Attack Munition) that allows them to plug in the images from the software. They launched them, and they got the tanks. That was considered a crude use of the software, to be kind.

Q What other exciting technology projects are you working on these days?

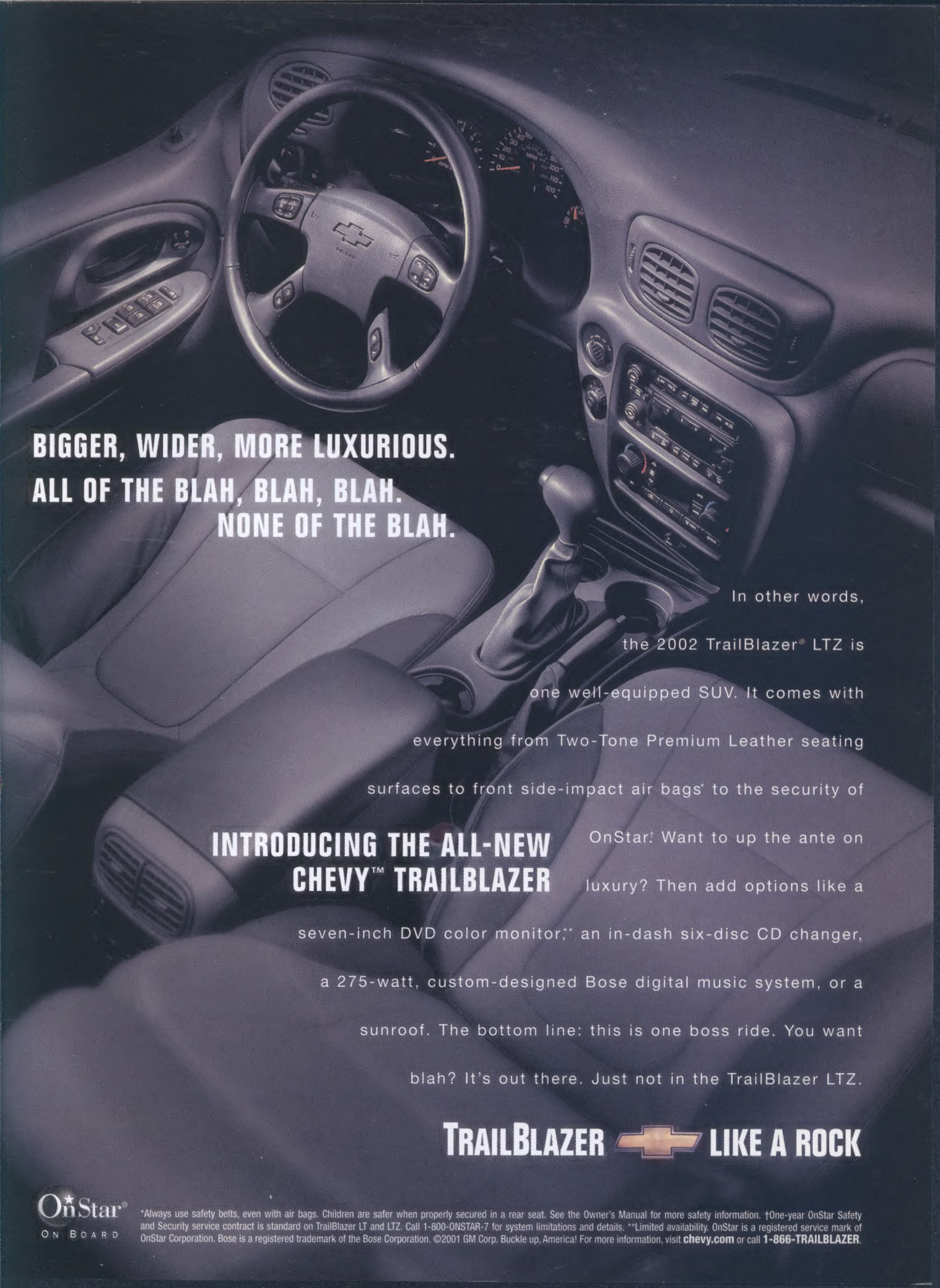
EVANS: I've started a company called VCommand (Voice Command) with Andrew Carrington, who founded Cambridge. VCommand is GPS (Global Positioning System)-driven. You can put it in a car or a bicycle or even a walker and it will navigate for you, hands-free.

Q Tell us about the technology.

EVANS: I have an older version of it in my car. I get in my car and start it in my garage, and before I back out, it asks, "Do you wish to navigate?" I say, "yes," and then it asks, "Where do you want to go?" There are choices available by addresses, intersections, or points of interest. I spell the point of interest, as in SFO, for San Francisco International Airport, and it takes me there. Our first production started at the end of 2001.

For our complete interview with Bob Evans, go to www.smartcomputing.com/cpumag/mar02/evans.

Gene Koprowski has been a journalist for 17 years, covering technology and computing for PBS-TV, The Wall Street Journal, and Forbes ASAP, among others.



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